United States
Department of
Agriculture

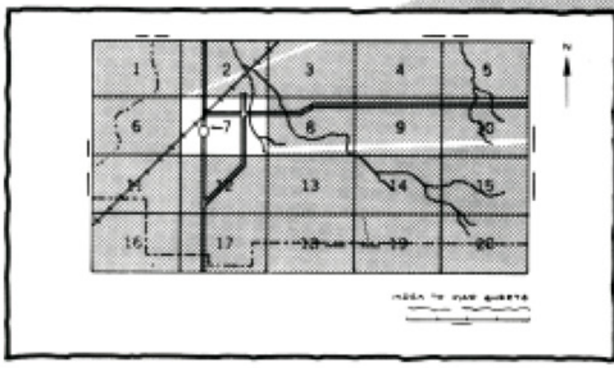
Soil
Conservation
Service

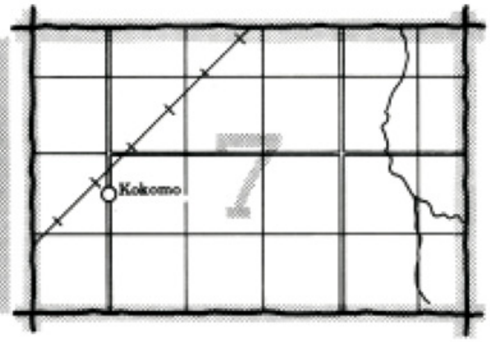
In cooperation with
United States Department of
Agriculture
Forest Service
Texas Agricultural Experiment
Station
and Texas State Soil and Water
Conservation Board

Soil Survey of Angelina County, Texas

HOW TO USE

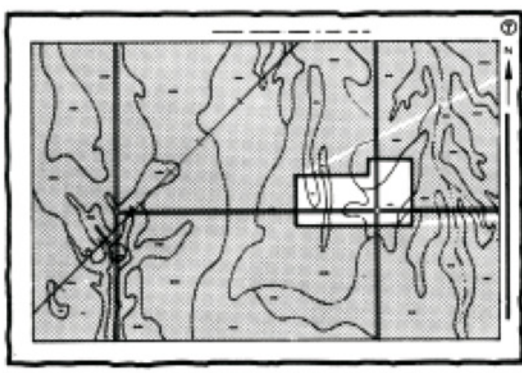
1. Locate your area of interest on the "Index to Map Sheets"

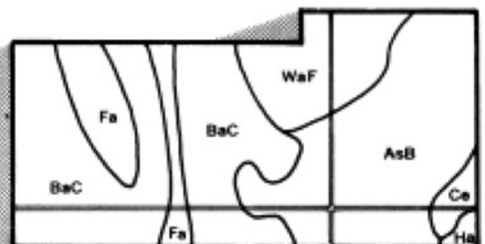




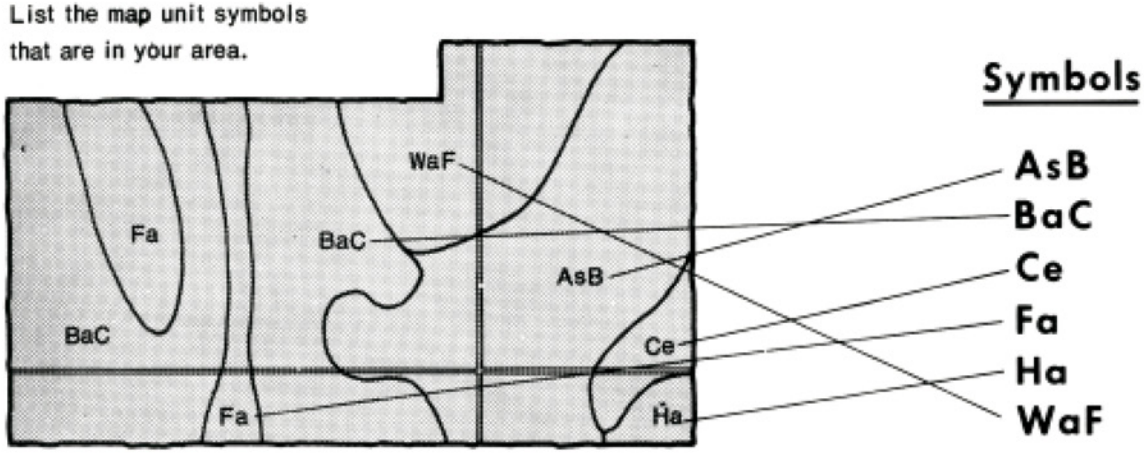
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



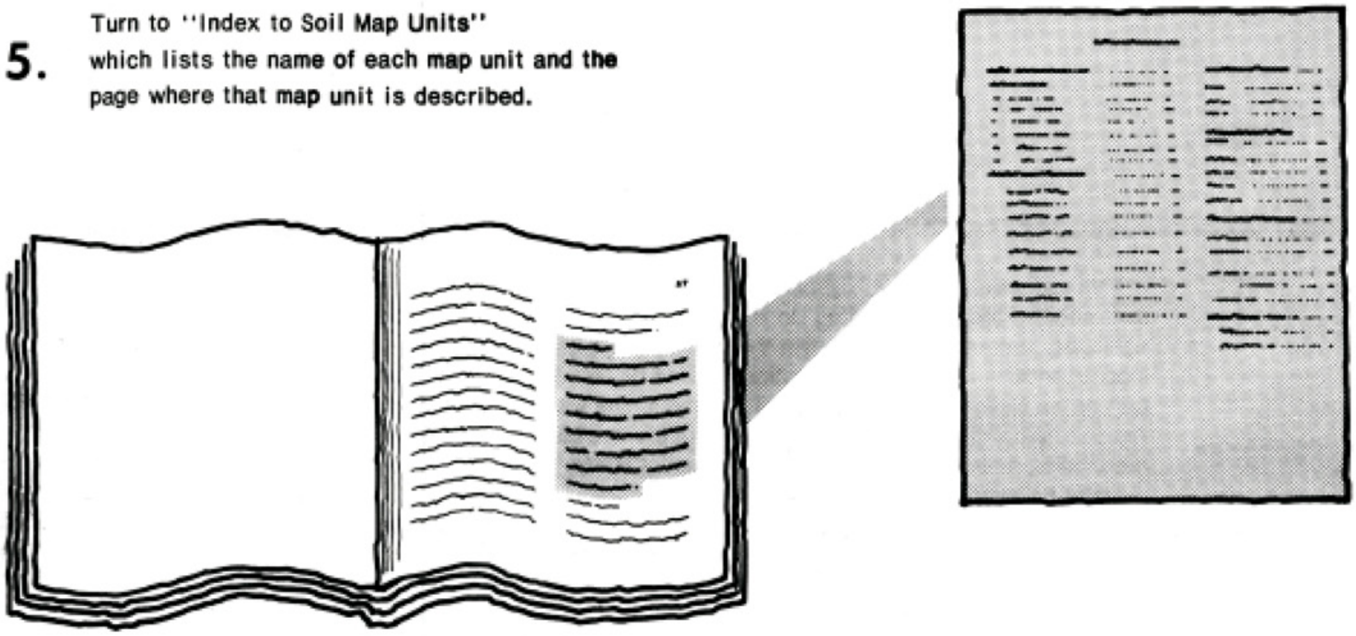


4. List the map unit symbols that are in your area.

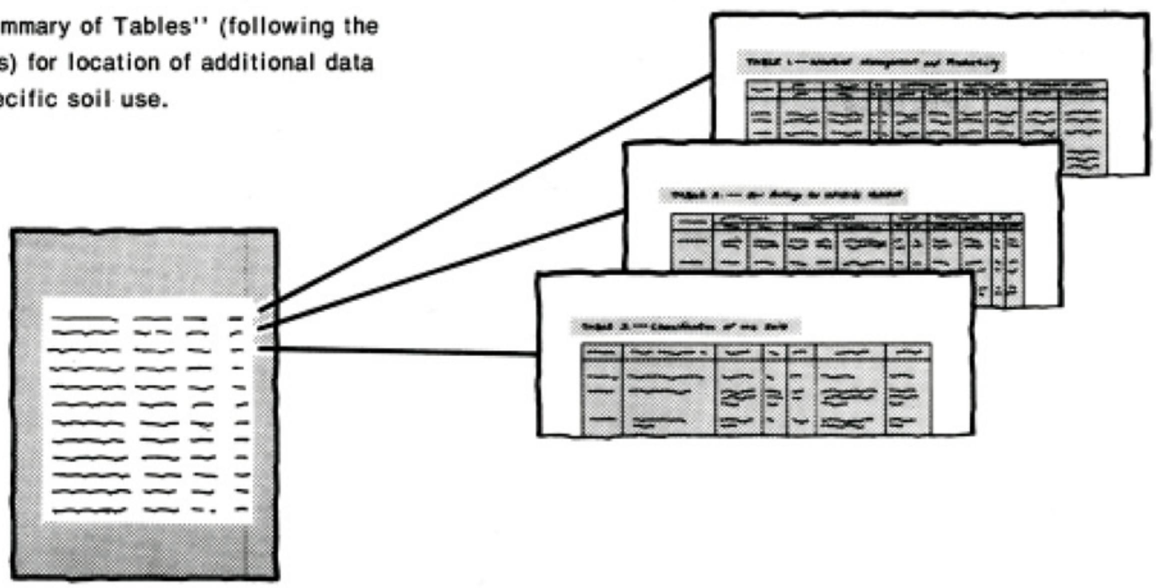


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1983. Soil names and descriptions were approved in 1984. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1983. This soil survey was made cooperatively by the Soil Conservation Service, the Forest Service, the Texas Agricultural Experiment Station, and the Texas State Soil and Water Conservation Board. It is part of the technical assistance furnished to the Upper Neches Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: A plantation of slash pine on Stringtown fine sandy loam, 5 to 15 percent slopes.

Contents

Soil Series

Issued February 1988

Index to Map Units

Summary of Tables

Foreword

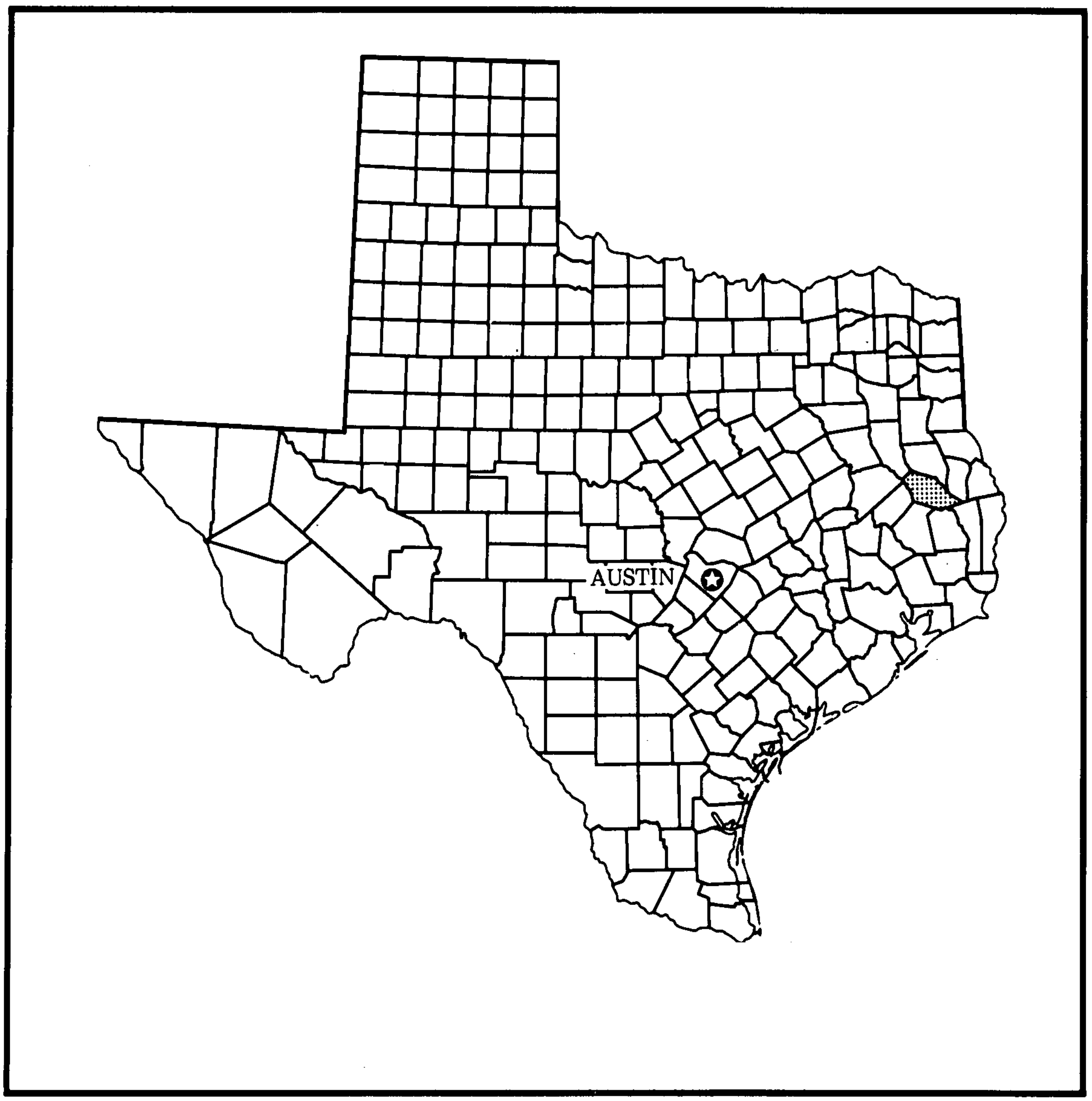
This soil survey contains information that can be used in land-planning programs in Angelina County, Texas. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Coy A. Garrett
State Conservationist
Soil Conservation Service



Location of Angelina County in Texas.

Soil Survey of Angelina County, Texas

By Raymond Dolezel, Soil Conservation Service

Fieldwork by Raymond Dolezel, Charles Fuchs, Lynn Gray, Tom Holt, and Levi Steptoe, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service and Forest Service
In cooperation with
Texas Agricultural Experiment Station and
Texas State Soil and Water Conservation Board

ANGELINA COUNTY is in the central part of east Texas. It is about 48 miles long from northwest to southeast and 24 miles wide from northeast to southwest. The western-southwestern boundary is the Neches River, and the eastern-northeastern boundary is the Angelina River and Sam Rayburn Reservoir. Cherokee County is north and Jasper County is southeast of Angelina County.

The county has 553,619 total acres: 514,645 acres of land and 38,974 acres of water. Elevation ranges from about 100 feet in the south near the Neches River to about 460 feet in the northern part of the county on the hills near Central.

Angelina County is in the East Texas Timberlands Land Resource Area. The soils formed mainly under forest vegetation in a humid environment. Most soils are light in color and low in natural fertility. Nearly level areas are often wet, and moderately steep to steep areas tend to erode easily.

The northern and southern parts of the county have a dendritic drainage system with many large streams. The central part, from Lufkin to Diboll to Huntington, is nearly level to gently sloping over most of the area. The drainageways are poorly defined.

General Nature of the Survey Area

The settlement and agriculture, natural resources, and climate of the county are discussed in this section.

Settlement and Agriculture

Angelina County was organized in 1846 from part of Nacogdoches County. It was named after the Angelina River, the namesake of an indian maiden.

Initial settlement was slow. Conditions for pioneers were primitive and harsh, especially during the temperature extremes of winter and summer.

In the early days, income was derived from cotton, corn, and livestock. Later, timber and timber products replaced normal farming operations. Much of the woodland area, about 62 percent of the county, also serves as a natural recreation and wildlife area. About 58,842 acres of woodland is administered by the U.S. Forest Service, and about 2,600 acres near Sam Rayburn Reservoir is controlled by the U.S. Corps of Engineers.

Natural Resources

Woodland is a very important natural resource of the county. Newsprint, paper, plywood, lumber, particle board, and many other products are manufactured

locally from the vast woodland resources. The woodland areas of the county are deversified and have various wildlife and recreation potential. Insect eating sundews and pitcher plants grow in bogs in the southern part of the county.

Angelina County has an abundant water supply. About 38,000 acres of Sam Rayburn Reservoir is in the county. The lake has about 114,000 surface acres. Many gallons of fresh water are used daily in the local paper and plywood mills.

Bentonite, or Fuller's Earth, has been mined for years from the volcanic deposits of the Catahoula Formation and similar formations (fig. 1). Some of these old clay pits are still open and serve as local waterholes. Quartzite is also mined from this area. Rocks from an old pit near the county line of Angelina and Jasper Counties were mined to build the original Galveston Seawall. Lignite coal will be mined, but oil and gas production is limited in the county.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Angelina County has long, hot summers because moist tropical air from the Gulf of Mexico persistently covers the area. Winters are cool and fairly short. The rare cold waves moderate in 1 or 2 days. Precipitation is fairly heavy throughout the year, and prolonged droughts are rare. Summer precipitation, mainly afternoon thunderstorms, is adequate for all crops.

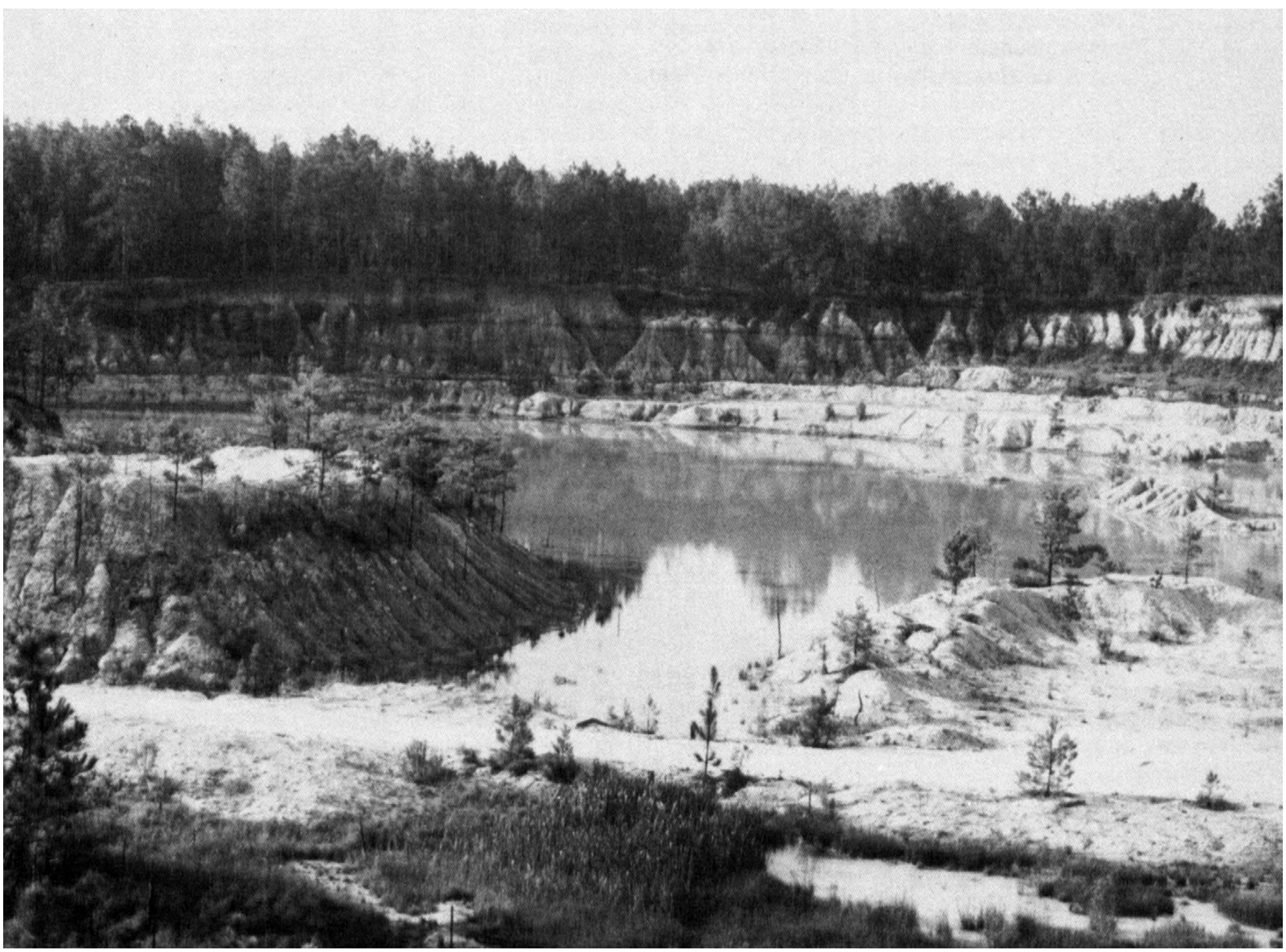


Figure 1.—Bentonite pit in southern Angelina County. This pit is in the Rayburn-Corrigan-Stringtown map unit.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Lufkin, Texas, in the period 1951 to 1980. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 50 degrees F, and the average daily minimum temperature is 39 degrees. The lowest temperature on record, which occurred at Lufkin on February 2, 1951, is -2 degrees. In summer the average temperature is 82 degrees, and the average daily maximum temperature is 93 degrees. The highest recorded temperature, which occurred at Lufkin on August 12, 1962, is 108 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 41 inches. Of this, 21 inches, or 50 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 16 inches. The heaviest 1-day rainfall during the period of record was 6.2 inches at Lufkin on September 22, 1965. Thunderstorms occur on about 62 days each year, and most occur in summer.

The average seasonal snowfall is 1 inch. The greatest snow depth at any one time during the period of record was 3 inches.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The sun shines 65 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 9 miles per hour, in spring.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material from which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area are generally collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or a building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

The 16 general soil areas in Angelina County are described on the following pages. About 93 percent of the county is in these units. The remaining 7 percent is water areas, mainly in Sam Rayburn Reservoir.

Loamy Soils That Have a Loamy Subsoil; on Uplands

This group of soils make up about 31 percent of the county. The major soils are the Fuller, Keltys, Diboll, and Kurth soils. These soils are in nearly level or gently sloping, broad, smooth, slightly concave to slightly convex areas. Drainage patterns are poorly defined. Sluggish stream channels are only slightly lower on the landscape. The soils are somewhat poorly drained or moderately well drained. Except for the City of Lufkin, most of the acreage of this group of soils is used as woodland and pasture. Bahiagrass or bermudagrass grow on improved pastures. Loblolly pine is the dominant natural pine species, but both loblolly pine and slash pine are in plantations.

1. Fuller-Keltys

Nearly level or gently sloping, somewhat poorly drained or moderately well drained soils

This map unit is made up of Fuller soils in broad and smooth to slightly concave areas and Keltys soils that are on slightly convex, long, low ridges. This map unit is generally confined to the Yegua Formation.

Fuller soils have poorly defined drainageways and are somewhat poorly drained. These soils are very slowly permeable. The surface is covered with crayfish mounds in some pasture areas. Keltys soils are slightly higher on the landscape than Fuller soils. They are moderately well drained and slowly permeable.

This map unit makes up about 16 percent of the county. It is about 54 percent Fuller soils, 19 percent Keltys soils, and 27 percent other soils (fig. 2).

Fuller soils typically have a fine sandy loam surface layer about 39 inches thick. It is dark grayish brown to grayish brown in the upper part, light brownish gray in the middle part, and light gray in the lower part. Crayfish holes have dark gray clay loam cups or waves. The subsoil, to a depth of 47 inches, is pale olive silty clay loam and light gray loam. The underlying material is pale olive, mildly alkaline or moderately alkaline siltstone. It is fractured in the upper part. Waves of dark gray, clayey material occur at all depths and fill the cracks in the underlying material.

Keltys soils have a fine sandy loam surface layer about 26 inches thick. The surface layer is dark grayish brown in the upper part, brown in the middle part, and in the lower part, it is pale brown with light gray mottles. The subsoil extends to a depth of 48 inches. It is strong brown fine sandy loam that has tongues of light brownish gray. The underlying material is brownish siltstone that has cracks in the upper part filled with dark grayish brown to dark gray material.

Included in this map unit are Alazan, Herty, Kurth, and Rosenwall soils. Alazan soils are loamy. They are generally lower on the landscape than Keltys soils but higher than Fuller soils. The loamy Kurth soils are in mixed patterns with Keltys soils. Herty soils are on the same landscape as Fuller soils. Herty soils have a plastic, clayey subsoil. Rosenwall soils have a reddish, plastic, clayey subsoil and generally are strongly sloping.

Except for much of the City of Lufkin, most of the acreage of this map unit is used as pasture and woodland.

Native pines and mixed hardwoods grow on these soils. Loblolly and shortleaf pines are dominant but both loblolly and slash pine are in plantations. These soils are suited to pine production, but wetness and seedling mortality are limiting factors, especially on the Fuller

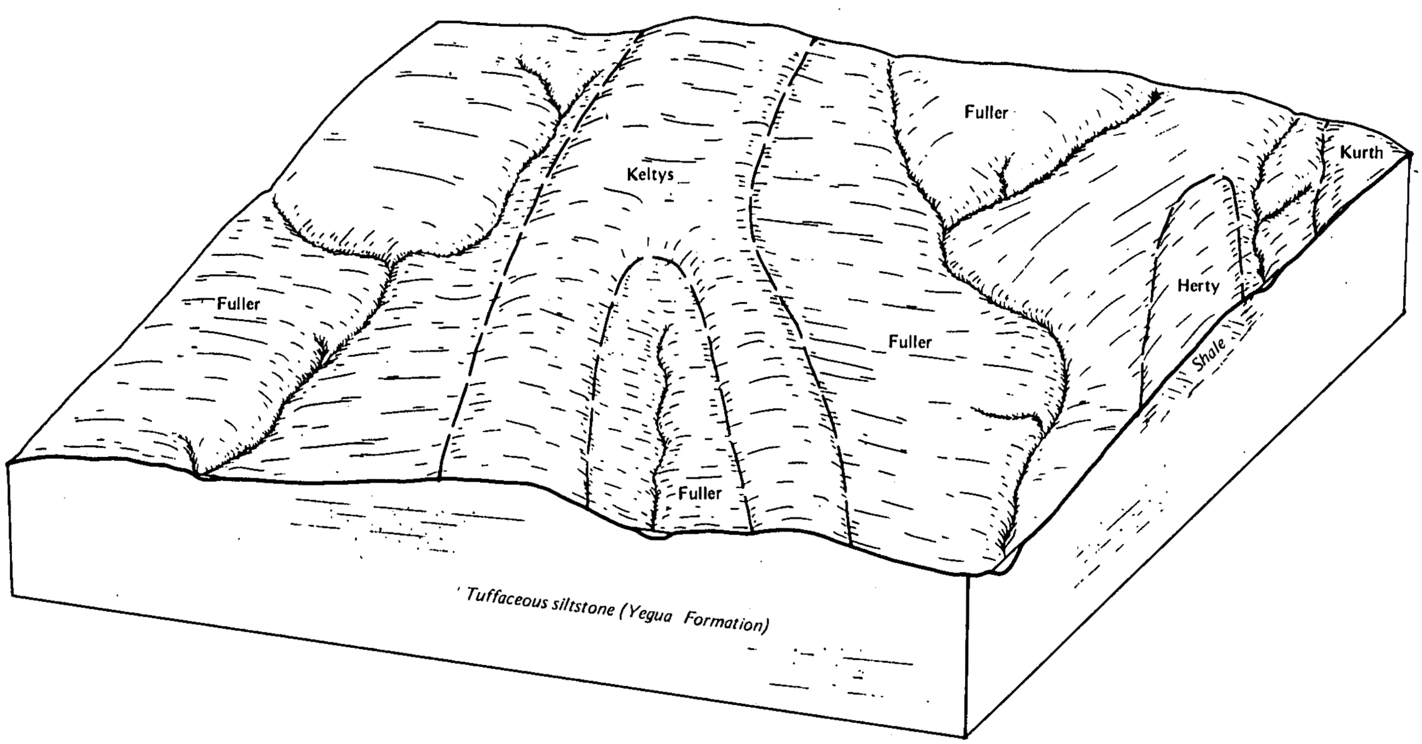


Figure 2.—Typical pattern of soils and underlying material in the Fuller-Keltys map unit.

soils. Seedlings are difficult to reestablish on Fuller soils that have been clearcut and site-prepared.

Fuller soils are moderately suited and Keltys soils are well suited to pasture. The main pasture grasses are coastal bermudagrass, common bermudagrass, and Pensacola bahiagrass. Some pastures are overseeded to arrowleaf clover. Forage yields are high under good management, but wetness and die-out of coastal bermudagrass limit high yields on Fuller soils. Fertilizer and lime are necessary for good yields. Crayfish and crayfish mounds are a problem in most pasture areas. When exposed to sunlight, the mounds become dry and hard and interfere with hay harvesting.

Fuller soils are poorly suited to urban and recreational uses. Keltys soils are moderately suited to urban uses and well suited to recreational uses. Wetness is the main limitation on both soils. Crayfish mounds interfere with the upkeep of lawns and gardens.

2. Keltys-Kurth

Nearly level or gently sloping, moderately well drained soils

This map unit is made up of Keltys and Kurth soils on broad, smooth and slightly convex, long, low ridges. These soils have poorly defined drainageways. They are moderately well drained and tend to be slightly wet late in winter and early in spring. Permeability is slow. These soils are in similar positions on the landscape. This map unit is generally in the northern part of the Yegua Formation.

This map unit makes up about 8 percent of the county. It is about 43 percent Keltys soils, 37 percent Kurth soils, and 20 percent other soils.

Keltys soils typically have a fine sandy loam surface layer about 26 inches thick. The surface layer is dark grayish brown in the upper part, brown in the middle part, and in the lower part, it is pale brown with light gray mottles. The subsoil extends to a depth of 48 inches. It is strong brown fine sandy loam and has tongues of light brownish gray. The underlying material is brownish siltstone that has cracks in the upper part filled with dark grayish brown to dark gray material.

Typically, Kurth soils have a fine sandy loam surface layer about 27 inches thick. The surface layer is dark brown in the upper part, brown in the middle part, and

pale brown in the lower part. The subsoil extends to a depth of 56 inches and has mottles in shades of red, gray, yellow, and brown. It is fine sandy loam in the upper part, sandy clay loam in the middle part, and in the lower part, it is sandy clay tongued with sandy clay loam. The underlying material is light brownish gray sandstone that has stains of yellowish brown.

Included in this map unit are Alazan, Fuller, and Sacul soils. Alazan soils are loamy and generally are in slightly concave areas. The loamy Fuller soils are in a mixed pattern with Keltys and Kurth soils. However, Fuller soils are generally on a smooth, slightly concave landscape and are wetter. Sacul soils have more clay in the subsoil and a thinner surface layer than Keltys or Kurth soils. Sacul soils generally are on gently sloping to strongly sloping side slopes immediately above drainageways.

Most of the acreage of this map unit is used as pasture and woodland. About a third of the city of Lufkin is in this map unit.

Native pines and mixed hardwoods grow on these soils. Loblolly pine is dominant; however, both loblolly and slash pines are in plantations. The soils in this map unit are well suited to pine production, but the lack of moisture during summer months is a limiting factor. Generally, pine seedlings are easily planted on these soils.

The soils in this map unit are well suited to use as pasture. The main pasture grasses are coastal bermudagrass, common bermudagrass, and Pensacola bahiagrass. Some pastures are overseeded to legumes, such as arrowleaf clover and singletary peas. Forage yields are high under good management, but wetness early in spring limits the yields of coastal and common bermudagrass. Fertilizer and lime are needed for good yields.

Keltys and Kurth soils are moderately suited to urban and recreational uses. Seasonal wetness is the main limitation.

3. Diboll-Keltys

Gently sloping, somewhat poorly drained or moderately well drained soils

This map unit is made up of Diboll soils on broad, nearly level to gently sloping, slightly concave interstream divides and Keltys soils on slightly convex, long, low ridges in slightly higher positions than Diboll soils. Diboll soils are somewhat poorly drained and very slowly permeable. In pasture areas, the surface is littered with crayfish mounds. Keltys soils are moderately well drained and slowly permeable. This map unit generally occurs on the Manning Formation. These soils are in units from east of Zavalla to the west of Diboll.

This map unit makes up about 7 percent of the county. It is about 55 percent Diboll soils, 24 percent Keltys soils, and 21 percent other soils (fig. 3).

Typically, Diboll soils have a very fine sandy loam surface layer about 29 inches thick. It is grayish brown in the upper part, and in the lower part, it is light brownish gray with strong brown mottles. Between depths of 17 and 29 inches are the remains of old crayfish holes that are filled with a light gray material that has dark gray streaks of silty clay. The next layer extends to a depth of 43 inches. It is light brownish gray and light yellowish brown clay loam that surrounds light olive brown siltstone. Light gray loam penetrates cracks in the upper part of this siltstone. The underlying material is light olive brown to pale olive siltstone. Cracks in the upper part of this siltstone are filled with light gray silt loam and dark gray silty clay loam.

Keltys soils have a fine sandy loam surface layer about 26 inches thick. The surface layer is dark grayish brown in the upper part, brown in the middle part, and in the lower part, it is pale brown with light gray mottles. The subsoil extends to a depth of 48 inches. It is strong brown fine sandy loam that has tongues of light brownish gray. The underlying material is brownish siltstone that has cracks in the upper part filled with dark grayish brown to dark gray material.

Included in this map unit are Alazan, Herty, Kurth, Raylake, and Rosenwall soils. The Alazan soils are loamy and are lower on the landscape than Diboll and Keltys soils. The Herty, Raylake, and Rosenwall soils have a plastic, clayey subsoil. Herty soils are on the same landscape as the Diboll soils. Moswell and Raylake soils are on slightly higher elevations, and Rosenwall soils are on moderately steep side slopes. Kurth soils are on the same landscape as Keltys soils, but Kurth soils have more clay in the lower part of the subsoil.

Most of the acreage of this map unit is used as woodland and pasture. Diboll soils are suited to use as woodland, and Keltys soils are well suited. Native pines and mixed hardwoods grow on these soils. Loblolly pine is dominant in naturally reseeded areas. Both loblolly and slash pines are in plantations. The main limiting factor for Diboll soils is wetness; however, the reestablishment of pine seedlings is a concern in some areas. On Diboll soils, natural regeneration should be considered as an alternative method to extensive site preparation. Keltys soils require more water during the summer months to be more productive.

Keltys soils are well suited and Diboll soils are moderately suited to use as pasture. The main pasture grasses are coastal bermudagrass, common bermudagrass, and Pensacola bahiagrass. Some pastures are overseeded to arrowleaf clover or white clover. Under good management, forage yields are medium for Diboll soils and high for Keltys soils but wetness limits high yields on Diboll soils. Fertilizer and lime are needed for good yields. Crayfish mounds cover the surface of the Diboll soils in most pasture areas. These mounds cause problems in harvesting hay.

Diboll soils are poorly suited to urban and recreational uses because of wetness and corrosivity. Because of

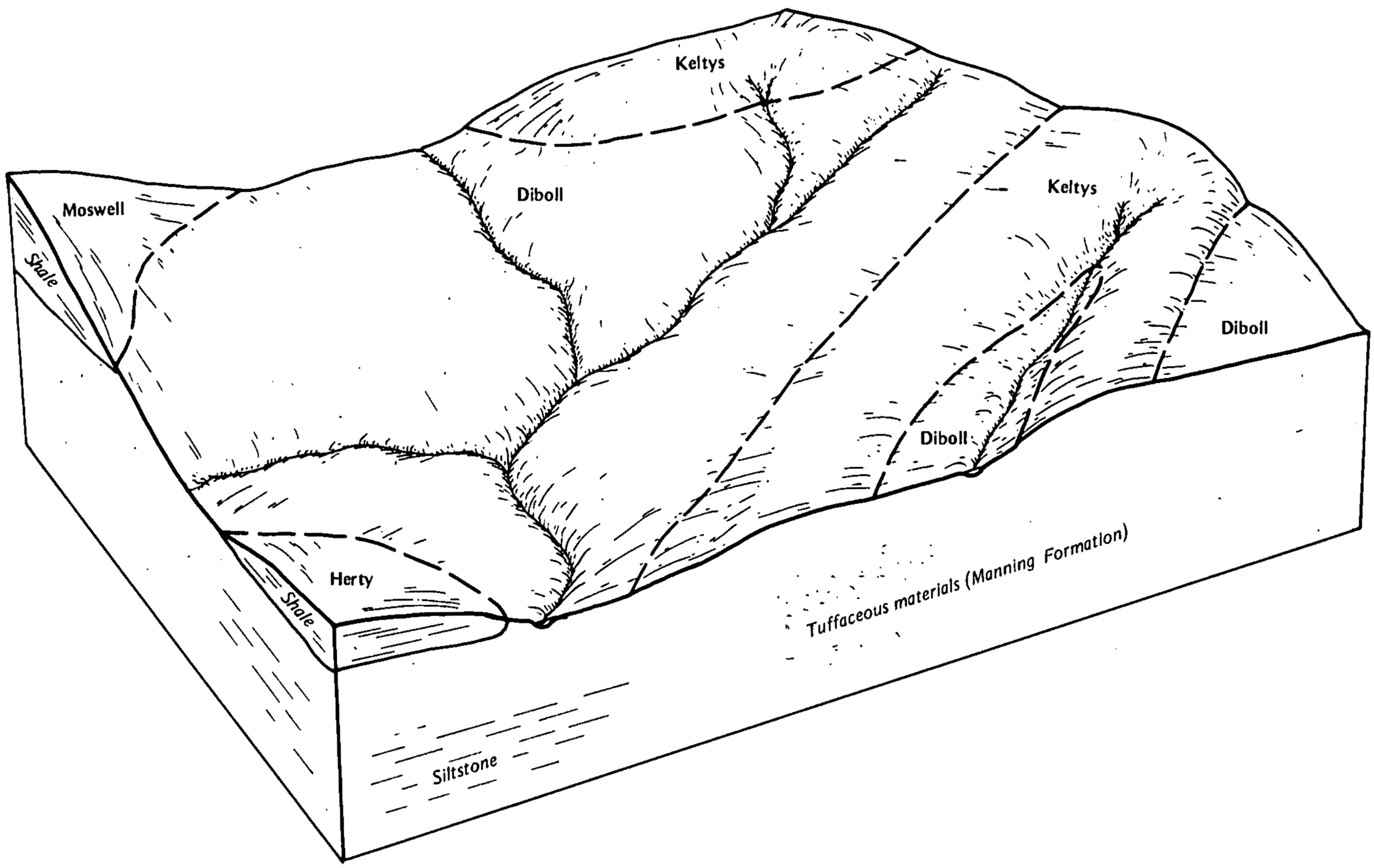


Figure 3.—Typical pattern of soils and underlying material in the Diboll-Keltys map unit.

wetness, Keltys soils are moderately suited to urban and recreational uses. Crayfish mounds interfere with the upkeep of lawns and gardens.

Loamy Soils That Have a Clayey Subsoil; on Uplands

This group of map units makes up about 20 percent of the county. The major soils are the Rosenwall, Sacul, Cuthbert, Kirvin, and Woodtell soils. These soils are on gently sloping to steep hilltops and side slopes in the northern part of the county. Kirvin soils are on ridge tops and generally have a gravelly surface layer.

Most of the acreage of this group of soils is used as woodland. Some areas are used for improved pastures of bahiagrass, common bermudagrass, and coastal bermudagrass. A few areas are used for crops.

4. Rosenwall

Gently sloping to strongly sloping, moderately well drained soils

This map unit is made up of soils on gently sloping broad ridgetops and strongly sloping side slopes immediately above and adjacent to flood plains. These areas are dissected and have an extensive dendritic drainage system. Rosenwall soils are moderately well drained and very slowly permeable.

This map unit makes up about 8 percent of the county. It is about 74 percent Rosenwall soils and 26 percent other soils (fig. 4).

Rosenwall soils typically have a fine sandy loam surface layer about 7 inches thick. The surface layer is dark grayish brown in the upper part and brown in the lower part. The subsoil is red clay to a depth of 23 inches. It has light gray mottles between depths of 15 and 23 inches. Below that, to a depth of 27 inches, the subsoil is mostly layers of red, light gray, grayish brown, and yellowish brown clay. The underlying material is

distinctly layered red, grayish brown, and yellowish brown sandstone and siltstone.

Included in this map unit are Darco, Herty, Keltys, Kurth, Moswell, Raylake, and Tenaha soils. Herty, Moswell, and Raylake soils, like Rosenwall soils, have a plastic, clayey subsoil. Herty and Raylake soils are in slightly concave positions, and Moswell soils are in about the same position as Rosenwall soils. Darco and Tenaha soils are sandy and are on broad ridges and hills, such as Moss Hill near Zavalla and Bill Hill near Manning. Keltys and Kurth soils have a loamy subsoil and are on broad ridges above strongly sloping areas of Rosenwall soils.

About 80 to 90 percent of the soil in this map unit is used as woodland. The remainder is used as pasture.

These soils are moderately suited to use as woodland. The clayey subsoil and the lack of deep development are the main limitations. Under natural conditions, these soils produce a mixed stand of pines and hardwoods. Loblolly and shortleaf pine dominate the forest type. Various red oaks are the main hardwood species. When clearcut, sloping to moderately steep areas of this soil erode severely.

Generally, these soils are moderately suited to use as pasture. Areas of these soils on the steeper slopes are poorly suited. The clayey subsoil, lack of deep development, and in some areas, steep slopes are limitations. The predominant improved grass is coastal bermudagrass. Lime and fertilizer and good management are needed to achieve high yields.

These soils are poorly suited to urban uses. The main limitations are the high shrink-swell potential of the clayey subsoil and, in some areas, the steep slopes. The soft bedrock underlying these soils is used for roadbuilding material. These soils are moderately suited to most recreational uses.

5. Sacul-Cuthbert-Kirvin

Gently sloping to steep, moderately well drained or well drained soils

This map unit is made up of Sacul, Cuthbert, and Kirvin soils. Sacul soils are on gently sloping, slightly concave heads of drainageways and strongly sloping side slopes immediately above drainageways. They are moderately well drained and slowly permeable. Cuthbert soils are on strongly sloping to steep side slopes and convex hilltops. They generally have a gravelly surface layer. These soils are well drained and moderately slowly permeable. Kirvin soils are on convex hilltops and have a

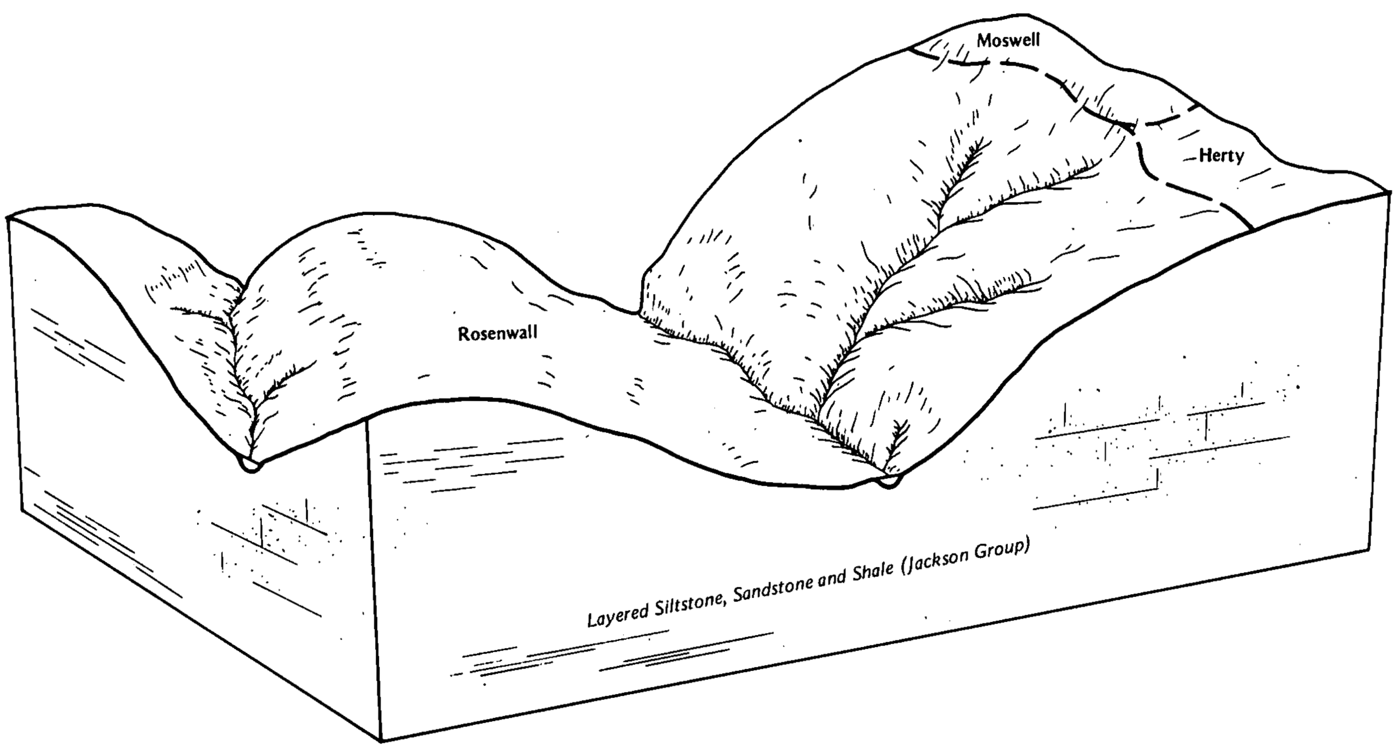


Figure 4.—Typical pattern of soils and underlying material in the Rosenwall map unit.

fine sandy loam surface layer that is gravelly in places. They are well drained and moderately slowly permeable.

This map unit makes up about 7 percent of the county. It is about 43 percent Sacul soils, 25 percent Cuthbert soils, 15 percent Kirvin soils, and 17 percent other soils (fig. 5).

Typically, Sacul soils have a dark brown fine sandy loam surface layer about 5 inches thick. The next layer, to a depth of 8 inches, is brown fine sandy loam. The subsoil is clay to a depth of 47 inches. In the upper part, it is red with light brownish gray mottles between depths of 16 and 27 inches. In the middle part, to a depth of 35 inches, the subsoil is mottled red, light gray, and strong brown. In the lower part, it is light gray with red and strong brown mottles. Below that layer, to a depth of 56 inches, the subsoil is light gray clay loam that has red and strong brown mottles. The underlying material to a depth of 65 inches is alternate layers of strong brown and yellowish red sandstone and light gray shale.

Cuthbert soils have a fine sandy loam surface layer about 9 inches thick that is dark brown in the upper part and pale brown in the lower part. This layer generally contains gravel, more than 15 percent in some areas. The subsoil extends to a depth of 37 inches. It is red clay in the upper part and yellowish red clay loam in the middle part. The lower part is partly weathered layers of yellowish red sandstone and light brownish gray shale. The underlying material to a depth of 60 inches is yellowish red sandstone that contains layers of grayish brown shale.

Kirvin soils typically have a fine sandy loam surface layer about 11 inches thick that is dark brown in the upper part and pale brown in the lower part. In places, this layer contains 15 percent or more gravel. The subsoil, to a depth of 35 inches, is red clay and clay loam that has strong brown mottles. Below that, to a depth of 46 inches, the subsoil is yellowish red clay loam that has strong brown mottles. The underlying material is yellowish red soft sandstone that has a few strong brown mottles. This sandstone contains layers of light gray shale.

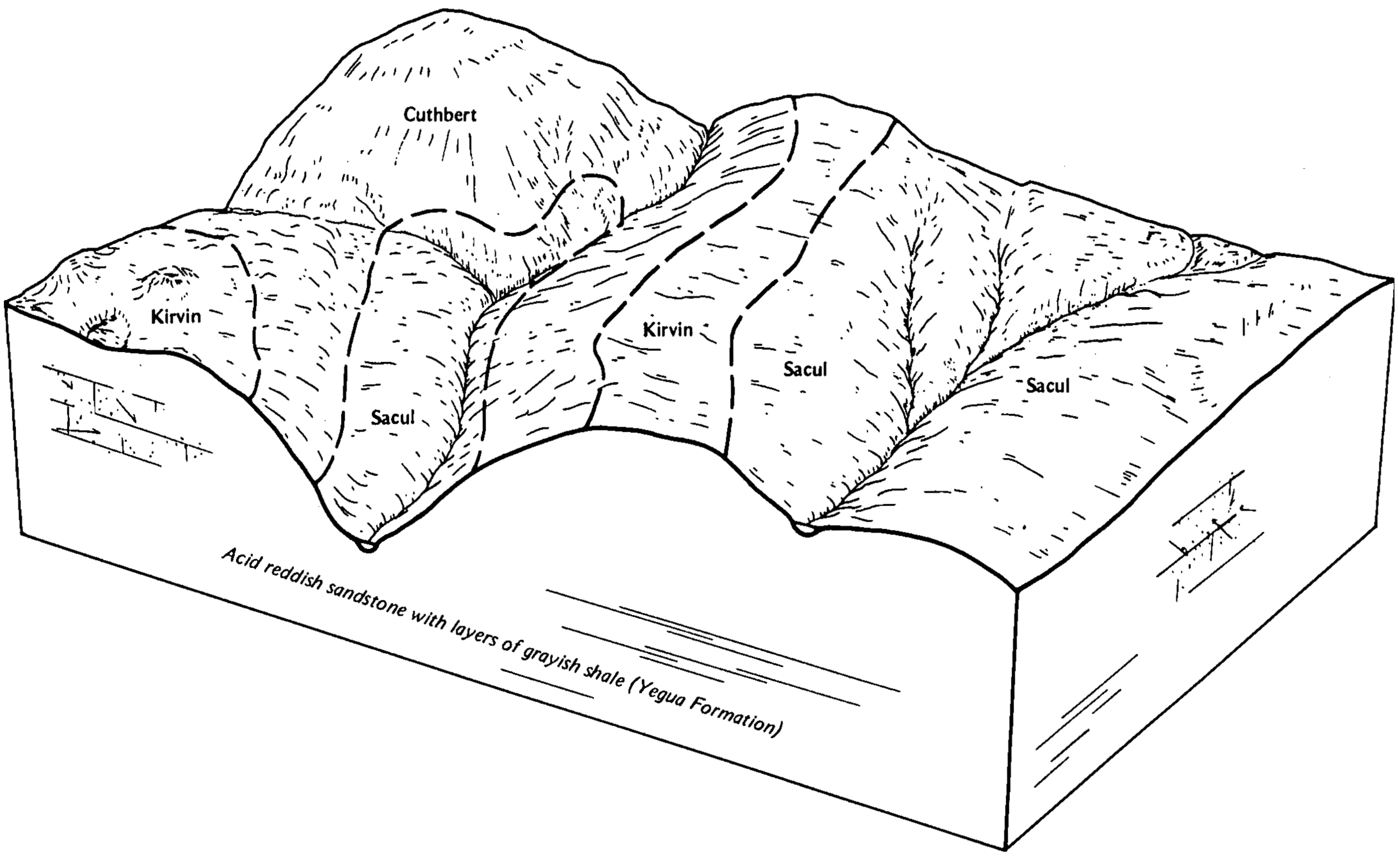


Figure 5.—Typical pattern of soils and underlying material in the Sacul-Cuthbert-Kirvin map unit.

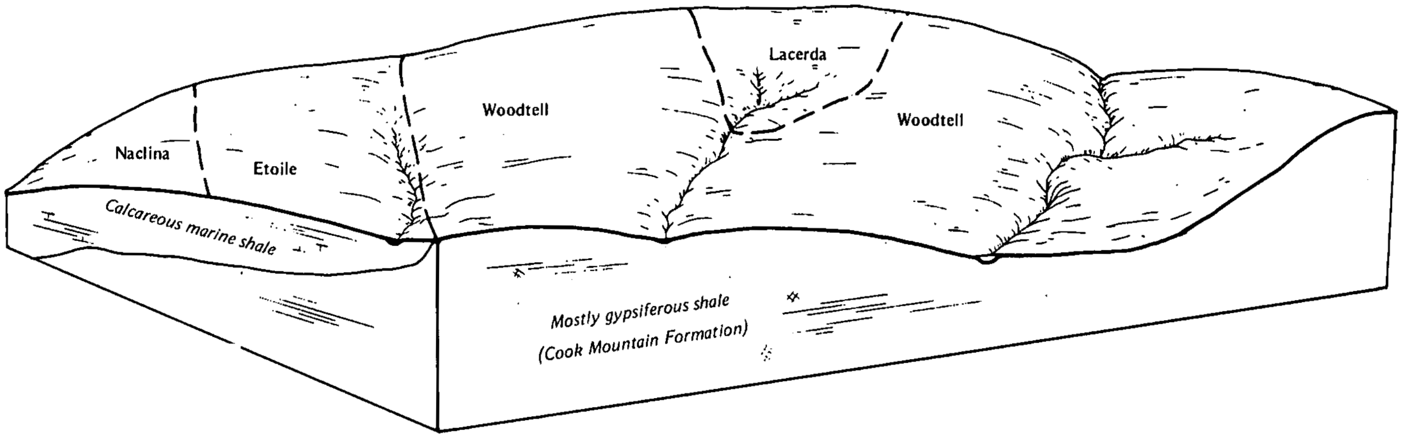


Figure 6.—Typical pattern of soils and underlying material in the Woodtell map unit.

Included in this map unit are a few high sandy hills of Darco, Lilbert, and Tenaha soils. At the base of these hills are areas of the slightly wet and sandy Rentzel soils. A few spots of Woodtell soils are also included.

Most of the acreage of this map unit is used as woodland. Some areas are used as pasture, and a few areas are used for crops.

The soils in this map unit are moderately suited to use as woodland. The clayey subsoil and low available water capacity are the main limitations. Forests on these soils are dominated by either loblolly or shortleaf pine. The pines are mixed with hardwoods normally dominated by red oaks.

These soils are moderately suited to use as pasture. Lack of available water and the clayey subsoil are limitations. Common bermudagrass, improved bahiagrass, and coastal bermudagrass are the main grasses used in improved pastures. Lime and fertilizer and good management are needed to achieve high yields.

Cuthbert and Kirvin soils are moderately suited to most urban and recreational uses. Cuthbert soils on steeper soils are poorly suited. Moderately slow permeability and moderate shrink-swell potential are the main limiting features on the flatter slopes of these two soils. Small stones on the gravelly soils can be a problem for some uses. Kirvin soils, graded, are poorly suited to urban and recreational uses because of the more clayey surface texture. Sacul soils are poorly suited to most urban uses and moderately suited to most recreational uses. Shrinking and swelling and slow permeability are the main limiting features. Slope is a limitation on the steeper slopes. Areas of Cuthbert and Kirvin soils that have a gravelly surface layer are sources of roadbuilding material. Many areas have already been mined for gravel.

6. Woodtell

Gently sloping to strongly sloping, moderately well drained soils

This map unit is made up of Woodtell soils in gently sloping, broad, smooth areas and on strongly sloping side slopes. These areas have a pronounced drainage system, and the soils are moderately well drained. Permeability is very slow.

This map unit makes up about 5 percent of the county. It is about 82 percent Woodtell soils and 18 percent other soils (fig. 6).

Typically, Woodtell soils have a very fine sandy loam surface layer about 4 inches thick that is dark grayish brown in the upper part and pale brown in the lower part. The subsoil extends to a depth of 41 inches. It is plastic and sticky clay. It is red in the upper part, and in the middle part, it is yellowish red with light gray mottles. In the lower part, it is mottled light gray and yellowish red. Some spots of olive gray shale are in the lower part of the subsoil. The underlying material is a light gray and olive yellow shale.

Included in this map unit are Etoile, Kirvin, Lacerda, Naclina, and Sacul soils. Etoile soils are similar to Woodtell soils but become calcareous in the lower part of the subsoil. Lacerda and Naclina soils are clayey to the surface, and Naclina soils are also calcareous. Kirvin and Sacul soils have a clayey subsoil, but the clay is not as sticky or as plastic as that of the Woodtell soils.

About 90 percent of the acreage is this map unit is used as woodland. The rest is mostly in pasture.

Woodtell soils are moderately suited to woodland production. The plastic and sticky clay subsoil is the main limitation. Loblolly and shortleaf pine share the forest canopy with mixed hardwoods of all types. Loblolly pines are generally in plantations.

Woodtell soils are moderately suited to pasture grasses, such as Pensacola bahiagrass and common and coastal bermudagrass. Lack of available water in the clayey subsoil is the main limitation. Fertilizer and lime are needed on most soils.

Because of the high shrink-swell potential and the very slow permeability, these soils are poorly suited to most urban and recreational uses.

Clayey or Loamy Soils That Have a Clayey or Loamy Subsurface Layer; on Flood Plains

This group of map units makes up about 16 percent of the county. The major soils are the Ozias, Pophers, Koury, Mantachie, and Marietta soils. These soils are on nearly level flood plains. Stream channels in these bottom land areas are crooked and meandering. This causes sluggish movement of water, and in some cases, annual flooding for long periods.

Most of the acreage of this group of soils is used as woodland. Only minor areas are used as pastures.

Hardwoods are dominate on Ozias, Pophers, and Mantachie soils. Pine and mixed hardwoods are native to Koury and Marietta soils. Most of the improved pastures on these soils are vegetated with bahiagrass and overseeded to arrowleaf clover.

7. Ozias-Pophers

Nearly level, somewhat poorly drained soils

This map unit is made up of Ozias and Pophers soils on the flood plain of the Neches River and several major streams where they join the river bottom land. These soils are subject to flooding almost annually. Slopes are less than 1 percent. Stream channels are shallow and extremely crooked, causing sluggish movement of water. Ozias soils are somewhat poorly drained and very slowly permeable. Pophers soils are somewhat poorly drained and slowly permeability.

This map unit makes up about 7 percent of the county. It is about 58 percent Ozias soils, 31 percent Pophers soils, and 11 percent other soils.

Ozias soils have a silty clay surface layer 10 inches thick. It is dark grayish brown and dark gray. The subsoil extends to a depth of 44 inches. It is grayish brown silty clay loam to a depth of 18 inches, and below that, it is dark gray silty clay that has strong brown mottles. The underlying material, between depths of 44 and 61 inches, is grayish brown silty clay that has yellowish red mottles. Below that, it is dark gray silty clay loam to a depth of 80 inches.

Pophers soils are silty clay loam throughout. The surface layer is 10 inches thick. It is dark grayish brown and dark brown with grayish brown and yellowish red mottles. The subsoil extends to a depth of 46 inches. In the upper part, it is grayish brown with brown mottles, and in the lower part, it is light gray with dark grayish brown and yellowish red mottles. The underlying material, to a depth of 65 inches, is dark grayish brown with stains of yellowish red. Below that to a depth of 80 inches it is very dark grayish brown with yellowish brown mottles.

Included in this map unit are small areas of Iuka, Koury, and Marietta soils that are in higher positions on the flood plain than Ozias and Pophers soils and are better drained. Also included are small areas of Mollville, Besner, and Alazan soils on terraces. These soils are 1 foot to 3 feet above the flooded bottom land areas. Mollville soils are shallow and somewhat poorly drained. Besner soils are better drained than Mollville soils. Alazan soils are slightly higher than the normal flood plain.

The soils of this map unit are used mostly as woodlands. Only isolated areas are used as pasture.

These soils are well suited to growing hardwoods; however, wetness hinders harvesting. Predominant trees are water oak, willow oak, overcup oak, and sweetgum. Native pines grow in a few areas.

These soils are poorly suited to use as pasture, and most pastures are not improved. Wetness is the main limitation. Drainage, fertilizer, and lime are necessary for good production. Improved bahiagrass is the main species in areas of this soil that are used as pasture.

These soils are not suited to cropland. Wetness and the hazard of flooding are limitations.

These soils are not suited to urban and recreational uses. The hazard of frequent flooding of long duration and the high water table are limitations.

8. Koury

Nearly level, moderately well drained soils

This map unit is made up of Koury soils that are moderately well drained and moderately slowly permeable. These soils are on most of the smaller stream bottom lands throughout the county. Slopes are less than 1 percent. Stream channels are deep cut and generally faster flowing than other bottom land streams.

This map unit makes up about 7 percent of the county. It is about 96 percent Koury soils and 4 percent other soils.

Koury soils have a pale brown surface layer about 17 inches thick that is loam and very fine sandy loam. The subsoil is silt loam. It extends to a depth of 50 inches. In the upper part, it is pale brown with light brownish gray mottles. In the lower part, it is light brownish gray with yellowish brown mottles. The underlying material is dark grayish brown silt loam that has yellowish brown mottles.

Included in this map unit are small areas of Iuka soils. These soils are better drained and coarser textured than Koury soils.

The soils of this map unit are used mainly as woodland. Some minor areas are used as pasture.

Koury soils are well suited to use as woodland. They are one of the best pine producing soils in the county. These soils produce a mixed growth of pines and hardwoods. Under natural conditions, loblolly pines dominate with a mixture of sweetgum, red oak, water oak, and numerous understory species. Loblolly and slash pines are in plantations.

Koury soils are well suited to use as pasture. The main pasture grasses are coastal bermudagrass, common bermudagrass, and Pensacola bahiagrass. Some areas have been overseeded to legumes, such as arrowleaf clover and white clover. Lime and fertilizer are needed for high yields.

Koury soils that are subject to frequent flooding are not suited to most urban and recreational uses. Those soils subject to occasional flooding are poorly suited to these uses. The main limitations are wetness and the hazard of flooding.

9. Mantachie-Marietta

Nearly level, somewhat poorly drained or moderately well drained soils

This map unit is made up of the somewhat poorly drained Mantachie soils on the flood plain of the Angelina River and the moderately well drained Marietta soils on flood plains of the Angelina River and some major streams. These soils are moderately permeable. Slopes are less than 1 percent.

This map unit makes up about 2 percent of the county. It is about 54 percent Mantachie soils, 42 percent Marietta soils, and 4 percent other soils.

Mantachie soils have a grayish brown clay loam surface layer about 5 inches thick. The subsoil is clay loam to a depth of 40 inches. In the upper part, it is mottled light gray and yellowish red, and in the middle part, it is light gray with strong brown mottles. In the lower part, it is mottled grayish brown and light gray. The underlying material is gray clay to a depth of 60 inches.

Marietta soils have a fine sandy loam surface layer about 10 inches thick that is brown in the upper part and in the lower part, it is dark brown with dark grayish brown mottles. The subsoil extends to a depth of 60 inches. To a depth of 20 inches, it is mottled dark brown and light brownish gray loam. Below that, the subsoil is sandy clay loam. In the upper part of this layer, it is mottled light brownish gray and dark brown, and in the lower part, it is mottled light brownish gray and strong brown with stripped areas of light gray.

Included in this map unit are small areas of Iuka soils. These soils are coarser textured than either Mantachie or Marietta soils.

Most Mantachie soils are used as woodland, and most Marietta soils are used as pasture. Few, if any, acres of these soils are used as cropland.

Mantachie soils are well suited to hardwoods, but wetness is a problem when harvesting. Water oak, willow oak, sweetgum, and red oaks grow naturally on these soils. Pines are not recommended for Mantachie soils. Marietta soils are well suited to pines and hardwoods. The major trees are water oak, willow oak, and sweetgum. Under natural conditions, loblolly pines are dominant, but slash pines are in some plantations.

Marietta soils are well suited to use as pasture, and Mantachie soils are poorly suited. Most of the areas of Marietta soils used for pasture are improved pastures of coastal bermudagrass, common bermudagrass, or Pensacola bahiagrass. Some areas have been overseeded to legumes, such as arrowleaf clover or white clover. Lime and fertilizer are needed for high yields. Very few areas of Mantachie soils are used as pasture.

Areas of Marietta soils subject to occasional flooding are poorly suited to most urban and recreational uses. The frequently flooded Marietta and Mantachie soils are not suited to these uses. Flooding and wetness are the main problems on both soils.

Loamy Soils That Have a Loamy or Clayey Subsoil; on Terraces and Uplands

This group of map units makes up about 14 percent of the county. The major soils are the Alazan, Moswell, and Bernaldo soils. They are on gently sloping to moderately steep slopes capped with wind-modified deposits. Drainage systems are poorly defined, and the streams have shallow channels.

Most of the acreage of this group of soils is used as woodland or pasture. Improved pastures consist of bahiagrass, common bermudagrass, and coastal bermudagrass. Under natural conditions, loblolly pines are dominant in woodland areas.

10. Alazan-Moswell

Nearly level to strongly sloping, somewhat poorly drained or moderately well drained soils

This map unit is made up of Moswell soils on gently sloping or strongly sloping side slopes capped with wind-modified deposits of Alazan soils. Moswell soils have a well defined drainage system. However, the nearly level to gently sloping areas of Alazan soils have poorly defined drainageways. Alazan soils are somewhat poorly drained and moderately permeable. Moswell soils are moderately well drained and very slowly permeable.

This map unit makes up about 9 percent of the county. It is about 55 percent Alazan soils, 30 percent Moswell soils, and 15 percent other soils.

Alazan soils have a very fine sandy loam surface layer about 16 inches thick that is dark gray in the upper part

and mottled brown and dark gray in the middle part. The lower part of this layer is pale brown with light brownish gray and yellowish brown mottles. The subsoil extends to a depth of 72 inches. It is loam to a depth of 58 inches. In the upper part of this layer, it is yellowish brown with light brownish gray mottles. In the lower part, it is mottled strong brown and yellowish brown and is penetrated with tongues of light gray. The subsoil to a depth of 72 inches is mottled yellowish red, strong brown, and light brownish gray sandy clay loam.

Typically, Moswell soils have a loam surface layer about 5 inches thick that is dark grayish brown and pale brown. The subsoil to a depth of 45 inches is very plastic and sticky clay. In the upper part, it is red with grayish brown mottles. In the middle part, to a depth of 23 inches, it is distinctly mottled grayish brown and yellowish red, and to a depth of 31 inches, it is yellowish red with grayish brown and yellowish brown mottles. In the lower part, the subsoil has mottles in shades of brown and gray. The underlying material is layers of olive to pale yellow shale that has an occasional layer of reddish shale.

Included in this map unit are Diboll, Herty, and Raylake soils. Diboll soils are in similar positions to those of the Alazan soils but are wetter and are mostly gray. Herty soils have a plastic clay loam and clay subsoil. They are in smooth, slightly concave areas. Herty and Raylake soils are intermixed with Moswell soils. Raylake soils have a clay loam surface layer.

About a third of the acreage in this map unit is used as pasture. The rest is used as woodland. Few, if any, areas are used for crops.

Moswell soils are moderately suited to use as woodland. The plastic, clayey subsoil is the main limitation. Alazan soils are well suited to use as woodland, but wetness is a limitation. Loblolly and shortleaf pines dominate the forest on these soils, but Moswell soils also have various hardwoods, mainly red oaks. Loblolly pines are dominant under natural conditions. Loblolly and slash pines are in plantations on the Alazan soils, and loblolly pines are generally on the Moswell soils.

Alazan soils are well suited to use for grass production. Wetness late in spring is a limitation. The main pasture grasses on these soils are Pensacola bahiagrass and common bermudagrass. Because of the plastic, clayey subsoil, Moswell soils are moderately suited to pasture grasses. Bahiagrass, common bermudagrass, and coastal bermudagrass are on these soils. Lime and fertilizer are needed for high yields.

Alazan soils are poorly suited to urban uses and moderately suited to recreational uses. Wetness is the main limitation. Because of shrinking and swelling and the very slow permeability, Moswell soils are poorly suited to urban and recreational uses.

11. Moswell-Bernaldo

Nearly level to strongly sloping, moderately well drained or well drained soils

This map unit is made up of areas of sloping to moderately steep Moswell soils on side slopes that round off at the top with gently sloping Moswell soils. The map unit also includes slightly higher areas of nearly level to gently sloping Bernaldo soils. The drainage system of this map unit is well pronounced. Moswell soils are moderately well drained, and Bernaldo soils are well drained. Moswell soils are very slowly permeable, and Bernaldo soils are moderately permeable.

This map unit makes up about 5 percent of the county. It is about 40 percent Moswell soils, 40 percent Bernaldo soils, and 20 percent other soils.

Typically, Moswell soils have a loam surface layer about 5 inches thick that is dark grayish brown and pale brown. The subsoil to a depth of 45 inches is very plastic and sticky clay. To a depth of 12 inches, it is red with grayish brown mottles, and to a depth of 23 inches, it is distinctly mottled grayish brown and yellowish red. To a depth of 31 inches, it is yellowish red with grayish brown and yellowish brown mottles. It has mottles in shades of brown and gray below that. The underlying material is layers of olive to pale yellow shale that has occasional layers of reddish shale.

Bernaldo soils have a fine sandy loam surface layer about 17 inches thick that is grayish brown, brown, and pale brown. The subsoil, to a depth of 50 inches, is strong brown loam. To a depth of 65 inches, it is yellowish brown loam that has yellowish red mottles and is penetrated with light brownish gray silty coatings on the soil structure.

Included in this map unit are Etoile, Fuller, Herty, and Raylake soils. Etoile, Herty, and Raylake soils are in positions similar to those of the gently sloping Moswell soils. Etoile soils are similar to Moswell soils but become calcareous in the lower part of the subsoil. Herty soils are much grayer than Moswell soils and are somewhat poorly drained. Raylake soils have a clay loam surface layer. Fuller soils are wetter than Moswell soils and are on broad interstream divides.

The soils in this map unit are used mainly as woodland. In a few areas, they are used as pasture. Few, if any, areas are used for crops.

Bernaldo soils are well suited to use as woodland, and loblolly pines are dominant. The small amount of summer rainfall is a limitation. Plantations on Bernaldo soils are generally planted to loblolly and slash pines. Moswell soils are moderately suited to pine, but the plastic, clayey subsoil is a limitation in planting pine seedlings. On these soils, loblolly and shortleaf pine are mixed with hardwoods dominated by red oaks. Loblolly pines are generally used in plantations.

Bernaldo soils are well suited to use as pasture. The main pasture grasses are coastal and common

bermudagrass. Moswell soils are moderately suited to use for Pensacola bahiagrass and coastal and common bermudagrass. The water holding capacity of the plastic, clayey subsoil is a limitation. Lime and fertilizer are needed for high yields.

Bernaldo soils are well suited to urban and recreational uses. Moswell soils are poorly suited because of the high shrink-swell potential and very slow permeability of the clayey subsoil.

Loamy to Sandy Soils That Have a Loamy to Sandy Subsoil; on Terraces

This group of map units makes up about 9 percent of the county. The major soils are the Besner, Mollville, Bienville, Bernaldo, Keithville, Sawtown, Moten, and Multey soils. These soils occur mainly as mounded, wind-modified deposits. The Bienville soils occur as natural sandy levees on the inside curve of existing and old river channels. Drainageways are poorly defined to nonexistent.

Probably more than half of the acreage of this group of soils is used as woodland. The rest is used as pasture or as home sites, especially near Lake Sam Rayburn.

Many species of grass are used on these soils, and a wide variety of trees grow in natural conditions.

12. Besner-Mollville-Bienville

Nearly level to gently sloping, poorly drained to somewhat excessively drained soils

This map unit is made up of Besner soils on mounds, Mollville soils in low or intermound areas, and Bienville soils on natural levees or deltas on the inside curve of existing and old stream channels. Besner soils are well drained and moderately permeable, and Mollville soils are poorly drained and slowly permeable. Bienville soils are somewhat excessively drained and moderately rapidly permeable.

This map unit makes up about 4 percent of the county. It is about 23 percent Besner soils, 17 percent Mollville soils, 15 percent Bienville soils, and 45 percent other soils (fig. 7).

Typically, Besner soils have a fine sandy loam surface layer about 26 inches thick that is dark brown in the upper part, brown in the middle part, and pale brown in the lower part. The subsoil, to a depth of 65 inches, is yellowish brown loam that has a few pale brown ped coatings from depths of 42 to 65 inches. To a depth of 80 inches, the subsoil is strong brown loam that is penetrated by lenses of light gray fine sandy loam.

Typically, Mollville soils have a loam surface layer about 10 inches thick that is dark gray and light brownish gray. The subsoil is clay loam. It extends to a depth of 55 inches. To a depth of 20 inches, it is grayish brown with strong brown mottles and tongues of light gray loamy material. To a depth of 43 inches, it is gray with strong brown mottles and tongues of light gray loam. Below that, it is light brownish gray and grayish brown with strong brown mottles. The underlying material is a light gray sandy clay loam.

Bienville soils have a loamy fine sand surface layer about 20 inches thick. It is dark brown in the upper part and yellowish brown in the lower part. The subsoil to a depth of 80 inches is strong brown loamy fine sand that has pale brown and very pale brown mottles and bands of yellowish red fine sandy loam.

Included in this map unit are Alazan, Attoyac, Bernaldo, and Keithville soils. Alazan and Bernaldo soils are mapped by themselves or in a complex with Besner soils. Attoyac soils are mainly in convex areas on a terrace landscape. They have a bright red sandy clay loam subsoil. Keithville soils are on smooth, nearly level to gently sloping terraces. The lower part of their subsoil is clayey.

The soils in this map unit are used mainly as woodland. In some areas, they are used as pasture. Some areas adjacent to Lake Sam Rayburn have been subdivided for use as home sites.

Besner and Bienville soils are well suited to woodland. Loblolly pines are dominant, but shortleaf pines are commonly intermixed with hardwoods of all types. A lack of moisture late in summer lowers woodland production. Mollville soils are poorly suited to pines because of wetness and ponding during winter and early in spring. However, these soils are moderately suited to water-loving hardwoods, such as water oak.

Besner soils are well suited to Pensacola bahiagrass and common and coastal bermudagrasses. Mollville soils are poorly suited to pasture. On these soils, Pensacola bahiagrass is best used in combination with white clover. Bienville soils are well suited to coastal bermudagrass and weeping lovegrass.

Besner and Bienville soils are well suited to urban and recreational uses. Mollville soils are poorly suited because of wetness and ponding.

13. Bernaldo-Keithville-Sawtown

Nearly level or gently sloping, somewhat poorly drained to well drained soils

This map unit is made up of Bernaldo soils on gently sloping, broad, low ridges and Keithville and Sawtown soils on an undulating landscape. Drainage patterns are poorly defined and are generally confined to the low areas of Keithville soils on intermounds of the wind-modified terraces. Sawtown soils are on the mounds. Bernaldo soils are well drained and moderately permeable. Keithville soils are somewhat poorly drained and slowly permeable. Sawtown soils are moderately well drained and moderately slowly permeable.

This map unit makes up about 3 percent of the county. It is about 32 percent Bernaldo soils, 26 percent Keithville soils, 23 percent Sawtown soils, and 19 percent other soils (fig. 8).

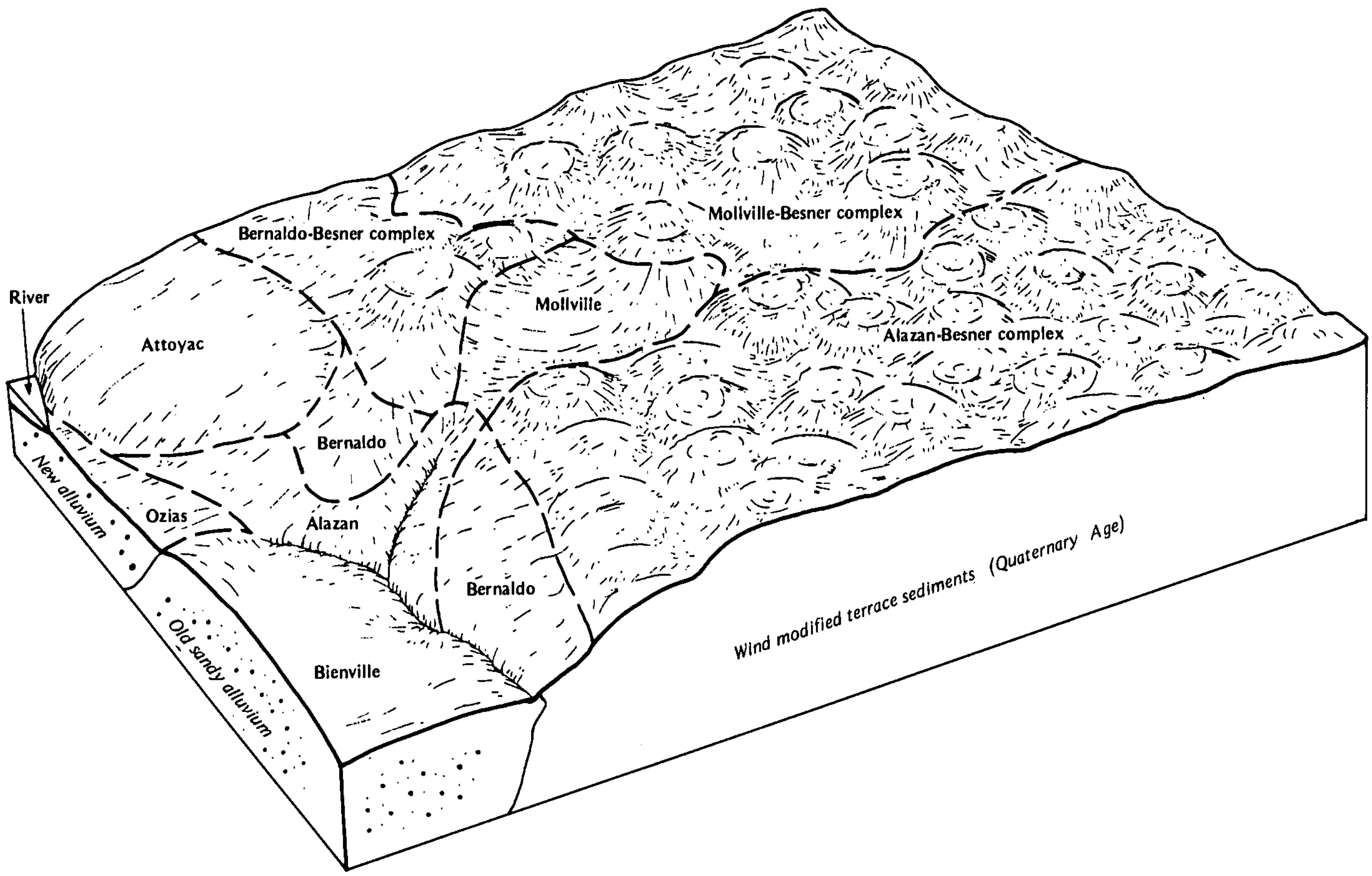


Figure 7.—Typical pattern of soils and underlying material in the Besner-Mollville-Bienville map unit.

Bernaldo soils have a fine sandy loam surface layer about 17 inches thick. It is grayish brown in the upper part, brown in the middle part, and pale brown below that. The subsoil, to a depth of 50 inches, is strong brown loam. To a depth 65 inches, it is yellowish brown loam that has yellowish red mottles and is penetrated by light brownish gray silty coatings on the soil peds.

Typically, Keithville soils have a silt loam surface layer about 10 inches thick that is dark grayish brown in the upper part and pale brown with strong brown mottles in the lower part. The subsoil extends to a depth of 65 inches. To a depth of 21 inches, it is strong brown silt loam. Below that, the subsoil is clay loam that is distinctly mottled strong brown, yellowish red, and light gray in the upper part; prominently mottled yellowish red, strong brown, and light gray in the middle part; and light gray with strong brown and pale brown mottles in the lower part. The underlying material to a depth of 80 inches is alternate layers of grayish brown, light brownish gray, and yellowish brown shale.

Typically, Sawtown soils have a fine sandy loam surface layer 17 inches thick that is dark grayish brown in the upper part, brown in the middle part, and pale brown in the lower part. The subsoil to a depth of 35 inches is yellowish brown loam that has pale brown mottles from depths of 23 to 35 inches. The subsoil is distinctly mottled yellowish red, yellowish brown, and light gray clay loam to a depth of 58 inches. To a depth of 65 inches, it is light gray clay loam that has strong brown mottles and is penetrated by light gray loamy material.

Included in this map unit are Alazan, Sacul, and Woodtell soils. Alazan soils are in concave areas similar to those of the Keithville soils. Sacul soils are on strongly sloping side slopes and have a clay subsoil. Woodtell soils have a plastic and sticky, clayey subsoil and are on gently sloping side slopes along incised drainageways.

The soils in this map unit are used equally as pasture and woodland. Only a few areas are used for truck crops.

The soils in this map unit are well suited to use as woodland. The lack of summer moisture is a limitation. Under natural conditions, loblolly pine is the dominant forest species. Mixed shortleaf pine, sweetgum, and oaks of all types are on these soils. Loblolly and slash pine are in plantations.

The soils in this map unit are well suited to pasture grass production. Lime and fertilizer are needed for high yields. The main pasture grasses are improved bahiagrasses, common bermudagrass, and coastal bermudagrass. A few areas are overseeded to legumes.

Bernaldo and Sawtown soils are well suited to most urban and recreational uses. Because of a high water table and slow permeability, Keithville soils are poorly suited.

14. Moten-Multey

Nearly level, mounded, somewhat poorly drained or moderately well drained soils

This map unit is made up of Moten and Multey soils on a mounded, wind-modified landscape. Moten soils are on the lows, and Multey soils are on mounds. The only drainage patterns are the sinuous lows of Moten soils. Moten soils are somewhat poorly drained and slowly permeable. Multey soils are moderately well drained and moderately permeable.

This map unit makes up about 2 percent of the county. It is about 45 percent Moten soils, 36 percent Multey soils, and 19 percent other soils.

Typically, Moten soils have a silt loam surface layer about 26 inches thick that is dark grayish brown to a depth of 4 inches and grayish brown below that. Stains of yellowish brown are at a depth of 9 to 26 inches. The subsoil, to a depth of 52 inches, is dark grayish brown silt loam that has lenses of light brownish gray. At a depth of 46 to 52 inches, it has reddish yellow mottles. The subsoil to a depth of 65 inches is dark grayish brown clay loam.

Typically, Multey soils have a fine sandy loam surface layer about 25 inches thick that is dark grayish brown in the upper part, brown in the middle part, and pale brown with brownish yellow stains in the lower part. The

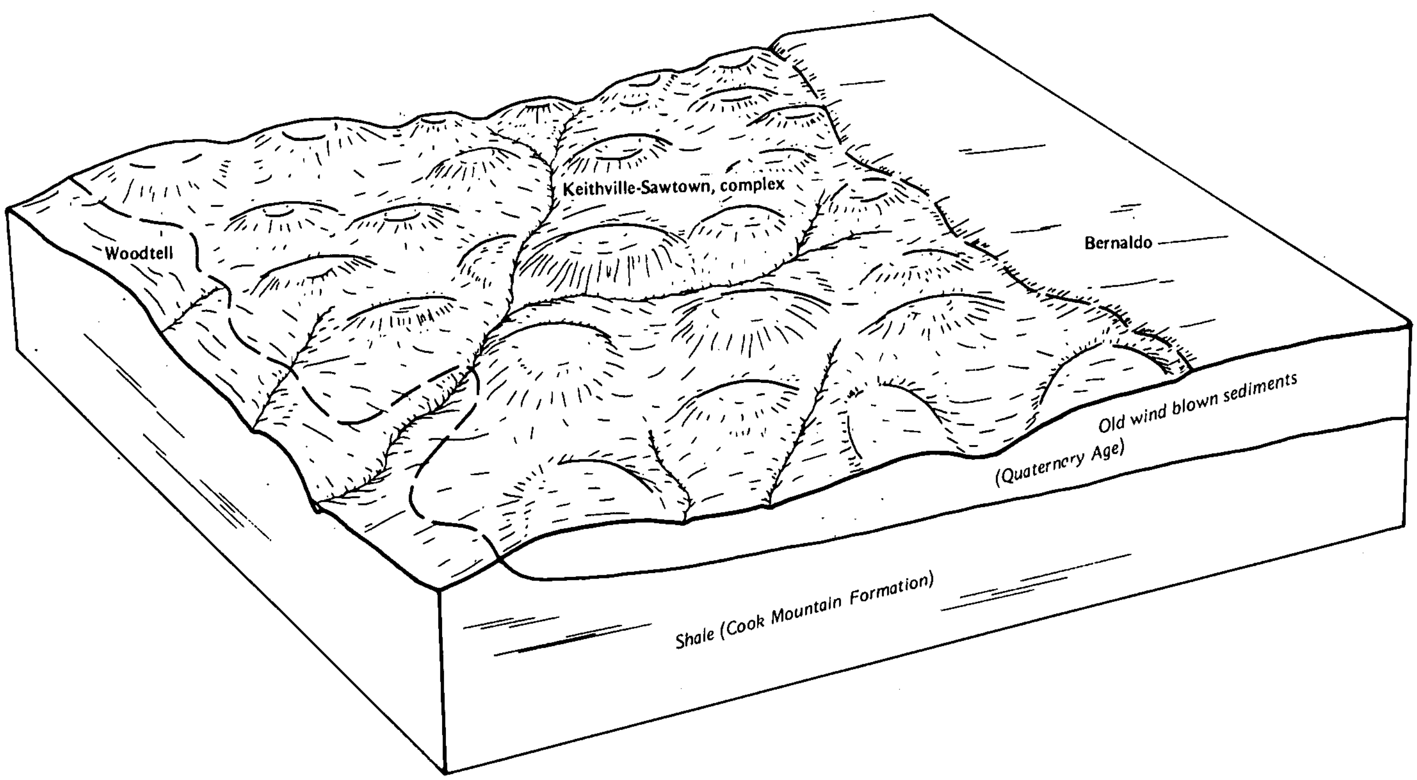


Figure 8.—Typical pattern of soils and underlying material in the Bernaldo-Keithville-Sawtown map unit.

subsoil, to a depth of 38 inches, is mottled pale brown and yellowish brown fine sandy loam that has lenses of light brownish gray. To a depth of 65 inches, it is yellowish brown loam that has mottles of grayish brown in the upper part and mottles of red and light gray in the lower part. The next layer to a depth of 70 inches is a grayish brown fine sandy loam.

Included in this map unit are Diboll soils that are similar to Moten soils but have impervious siltstone as underlying material. Also included are areas of Keltys soils that are similar to Multey soils but have sandstone as underlying material.

This soil is used mainly as woodland. A few minor areas are used as pasture.

Moten soils are moderately suited and Moten soils are well suited to use as woodland. Loblolly pine is dominant on Multey soils but shares Moten soils with water oak and willow oak. Wetness is a limiting factor to the use of the Moten soils as a woodland, and the lack of available water in summer is a limiting factor of the Multey soils.

Moten soils are moderately suited to Pensacola bahiagrass. Multey soils are well suited to common and coastal bermudagrass. Lime, fertilizer, and good management are needed for high yields.

Because of wetness, Moten soils are poorly suited to most urban and recreational uses. Multey soils are well suited.

Loamy Soils That Have a Clayey or Loamy Subsoil; on Uplands

This group of soils makes up about 2 percent of the county. The major soils are the Rayburn, Corrigan, and Stringtown soils. These soils are on side slopes and strongly sloping to steep hills.

Most of the acreage of this group of soils is used as woodland. A few small areas are used as pasture. Several large clay pits are in this map unit.

15. Rayburn-Corrigan-Stringtown

Gently sloping to steep, well drained to somewhat poorly drained soils

This map unit is made up of Rayburn soils in gently sloping areas and on strongly sloping side slopes, Corrigan soils on lower slopes, and Stringtown soils on strongly sloping to steep hills. Rayburn soils are moderately well drained and very slowly permeable. The Corrigan soils are gently sloping. They are somewhat poorly drained and very slowly permeable. Stringtown soils are well drained and moderately permeable. The drainage system is very pronounced except in areas of Corrigan soils.

This map unit makes up about 2 percent of the county. It is about 23 percent Rayburn soils, 20 percent Corrigan soils, 20 percent Stringtown soils, and 37 percent other soils (fig. 9).

Typically, Rayburn soils have a fine sandy loam surface layer about 8 inches thick. It is dark grayish brown in the upper part and grayish brown in the lower part. The subsoil is clay. It extends to a depth of 50 inches. In the upper part, it is red with grayish brown mottles. In the middle part, it is mottled light brownish gray and red, and in the lower part, it is light brownish gray with strong brown mottles. The underlying material to a depth of 60 inches is light gray tuffaceous sandstone that is mottled with olive yellow.

Corrigan soils typically have a fine sandy loam surface layer about 6 inches thick that is dark gray to a depth of 5 inches and grayish brown below that. The subsoil extends to a depth of 39 inches. It is very sticky and plastic clay and is mottled grayish brown and dark grayish brown in the upper part, grayish brown in the middle part, and in the lower part, it is light olive gray with a few spots of light gray. The underlying material is olive gray and pale olive tuffaceous siltstone.

Stringtown soils have a fine sandy loam surface layer about 12 inches thick that is dark grayish brown in the upper part and pale brown in the lower part. The subsoil, to a depth of 41 inches, is strong brown sandy clay loam that has red mottles below a depth of 24 inches. To a depth of 50 inches, the subsoil is partly weathered yellowish brown and red sandstone that has thin layers of light gray shale. The underlying material to a depth of 60 inches is thinly bedded light gray shale and strong brown and red sandstone.

Included in this map unit are Browndell, Herty, Kisatchie, and Raylake soils. Browndell soils are shallow, and in places, the surface is strewn with boulders. Kisatchie soils are on sloping to strongly sloping side slopes. They are similar to Corrigan soils but are better drained. Herty soils have a clayey shale underlying material. Raylake soils are clayey throughout.

About 95 percent of the acreage of this map unit is used as woodland. Only isolated, minor areas are used as pasture. Less than 20 acres is used for gardens. Several large clay pits are in this map unit.

Rayburn soils are well suited to use as woodland. Loblolly, shortleaf, and longleaf pine grow in a mixture with various hardwoods. Thick stands of grasses and moderate to thin stands of longleaf pine grow on these soils. Because of wetness and the plastic, clayey subsoil, Corrigan soils are moderately suited to pine production. Stringtown soils are well suited to use as woodland. In areas of these soils, longleaf pine forms a thin canopy over a dense understory of different grasses.

Rayburn soils are poorly suited to use as pasture because of the clayey subsoil. Corrigan and Stringtown soils are moderately suited, but extreme care should be used before the moderately steep to steep areas of Stringtown soils are cleared for any reason. Pensacola bahiagrass is dominant on the few acres of the soils in this map unit used as pasture; however, coastal and common bermudagrass will grow.

Rayburn and Corrigan soils are poorly suited to most recreational and urban uses mainly because of the high

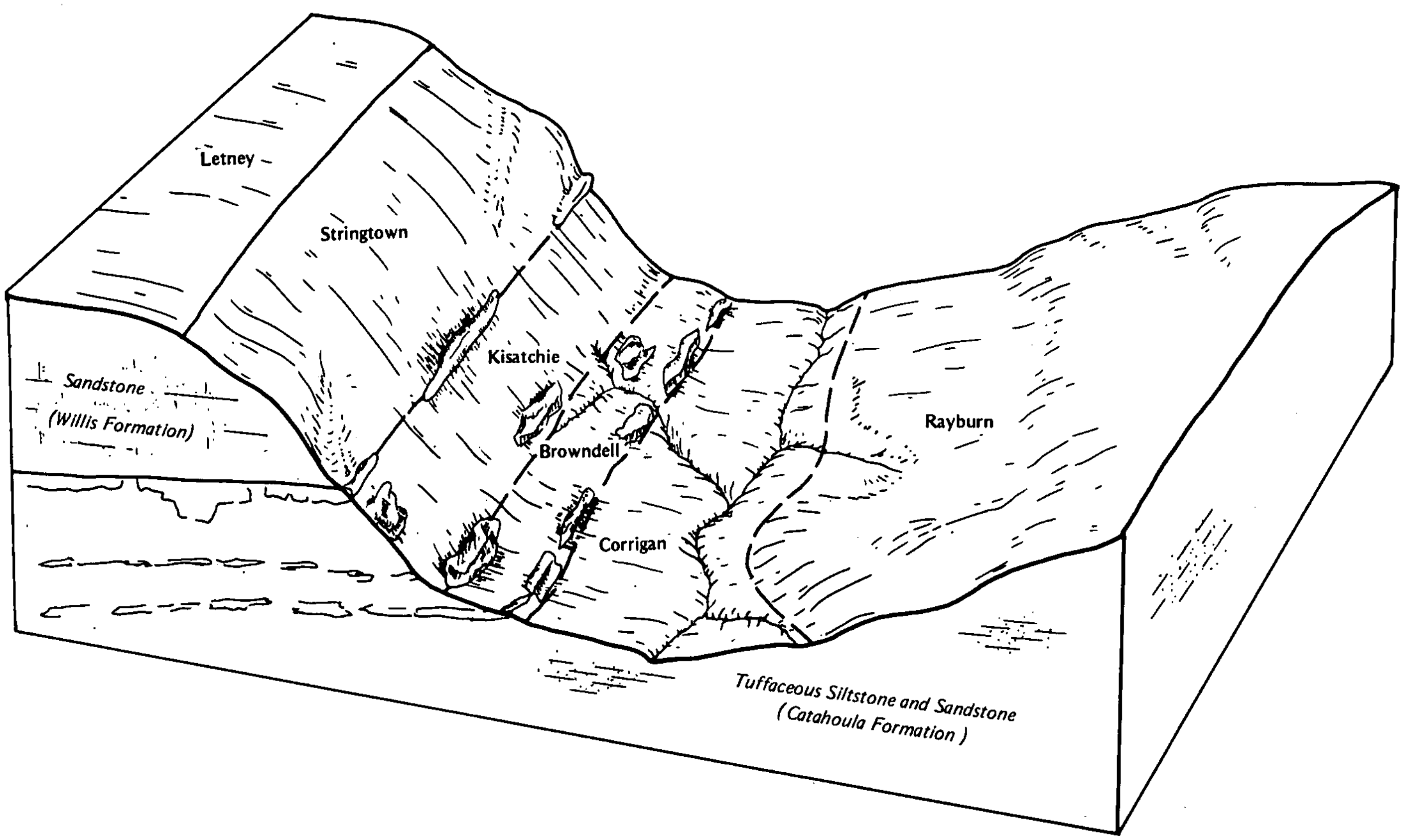


Figure 9.—Typical pattern of soils and underlying material in the Rayburn-Corrigan-Stringtown map unit.

shrink-swell potential of the clayey subsoil and the very slow permeability. Most Stringtown soils are moderately suited to most urban and recreational uses. The soils on steeper slopes are poorly suited.

Large, deep bentonite pits are in areas of this map unit. Bentonite, or Fuller's Earth, is used primarily for drillers mud and as a pond sealer. Quartzite is mined in this area. It is crushed and used in road beds. The material used to build the original Galveston Seawall was extracted from the area known as "the blue hole."

Sandy or Loamy Soils That Have a Loamy Subsoil; on Uplands

This group of soils makes up about 1 percent of the county. The major soils are the Letney, Stringtown, and Tehran soils. These soils are on strongly sloping to steep hills and on hilltops.

Except for a few home sites near Lake Sam Rayburn, the acreage of this map unit is used as woodland. Most of this map unit is in the Angelina National Forest.

16. Letney-Stringtown-Tehran

Gently sloping to steep, well drained or somewhat excessively drained soils

This map unit is made up of Stringtown soils on strongly sloping to steep hills capped with either gently sloping areas of sandy Letney soils or strongly sloping areas of sandy Tehran soils. Drainageways are made up of sandy, wet soils that do not have a defined stream channel. Letney soils are well drained and moderately rapidly permeable. Stringtown soils are well drained and moderately permeable. Tehran soils are somewhat excessively drained and moderately rapidly permeable.

This map unit makes up about 1 percent of the county. It is about 39 percent Letney soils, 24 percent Stringtown soils, 18 percent Tehran soils, and 19 percent other soils (fig. 10).

Typically, Letney soils have a loamy sand surface layer about 35 inches thick that is dark grayish brown, brown, and pale brown. The subsoil is sandy clay loam to a depth of 80 inches. It is yellowish brown mottled with

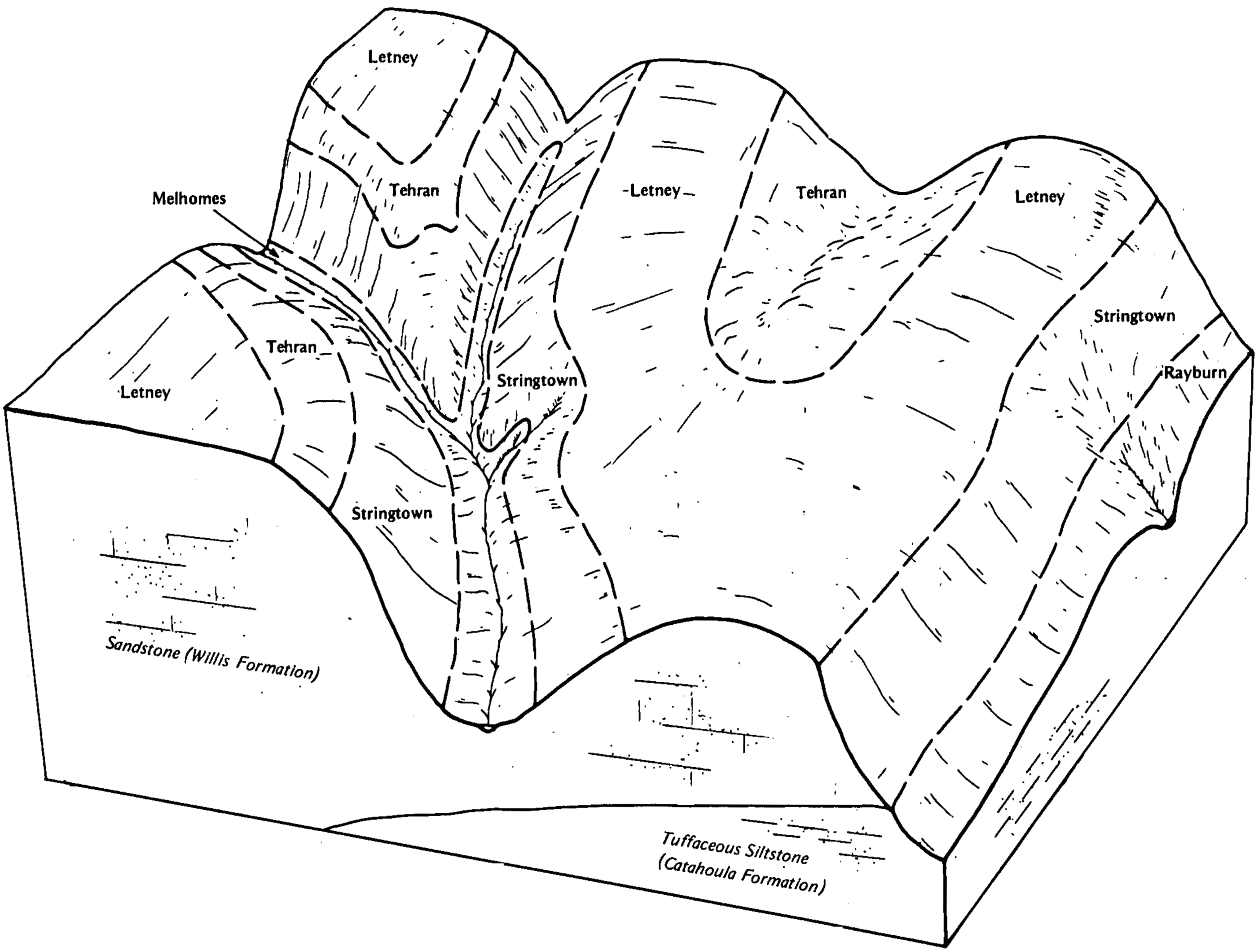


Figure 10.—Typical pattern of soils and underlying material in the Letney-Stringtown-Tehran map unit.

yellowish red mottles to a depth of 61 inches and yellowish brown with distinct mottles of red and light gray below that.

Stringtown soils have a fine sandy loam surface layer about 12 inches thick that is dark grayish brown and pale brown. The subsoil, to a depth of 41 inches, is strong brown sandy clay loam. It has red mottles in the lower part. To a depth of 50 inches, it is partly weathered yellowish brown and red sandstone that has thin layers of light gray shale. The underlying material to a depth of 60 inches is thinly bedded light gray shale and strong brown and red sandstone.

Typically, Tehran soils have a loamy sand surface layer about 53 inches thick. It is dark grayish brown, brown, and pale brown and has stains of dark grayish brown between depths of 9 and 53 inches. The subsoil to a depth of 70 inches is mottled strong brown and yellowish red sandy clay loam.

Included in this map unit are mostly sandy and wet Melhomes soils in drainageways. A few areas of Rayburn soils are on side slopes. They are redder and more clayey than Stringtown soils. The gray Corrigan and Kisatchie soils are on the lower part of some slopes.

Except for a few home sites adjacent to Lake Sam Rayburn, the acreage in this map unit is used as woodland. Most of this map unit is in the Angelina National Forest.

Letney soils are well suited to pines, and Tehran soils are moderately suited. These soils have a droughty surface layer. Stringtown soils are well suited to moderately suited to use as woodland. Steepness of slope and the lack of moisture in summer are the main limitations. Longleaf pine is dominant on the soils in this map unit. A few scattered sandjack oaks are also on these soils. The understory consists of various grasses.

Letney soils are well suited and Tehran soils are poorly suited to use as pasture. Coastal bermudagrass and weeping lovegrass are grown. Stringtown soils are moderately suited to poorly suited to grasses, and areas of these soils on steep slopes are best left in forest.

Letney soils are well suited and Tehran soils are moderately suited to urban and recreational uses. The sandy surface layer is the main limitation on both soils. Most areas of the Stringtown soils are moderately suited to these uses. The soils on steep slopes are poorly suited.

Bogs are in a few areas of this map unit. Pitcher plants and orchids grow on the soils in these areas.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Cuthbert fine sandy loam, 5 to 15 percent slopes, is one of several phases in the Cuthbert series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Mollville-Besner complex, gently undulating, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

AaB—Alazan very fine sandy loam, 0 to 4 percent slopes. This deep, nearly level to gently sloping soil is on terraces and low uplands throughout most of the county. This soil formed in sediment partly reworked by wind. Slopes are mainly less than 1 percent. The mapped areas are mostly less than 200 acres.

This soil has a very fine sandy loam surface layer about 16 inches thick. It is dark gray to a depth of 4 inches, mottled brown and dark gray from 4 to 9 inches, and pale brown with light brownish gray and yellowish brown mottles from 9 to 16 inches. The subsoil is loam to a depth of 58 inches. It is yellowish brown with light brownish gray mottles to a depth of 37 inches, and below that, it is mottled strong brown and yellowish brown with tongues of light gray. The subsoil to a depth of 72 inches is mottled yellowish red, strong brown, and light brownish gray sandy clay loam.

This soil has a high available water capacity. It is moderately permeable and somewhat poorly drained. Runoff is slow to medium. This soil is saturated late in winter and early in spring. It has a water table at a depth of 18 to 30 inches. Erosion is a slight hazard.

Included in mapped areas of this soil are concave spots of Mollville soils on which water ponds during the cool season. Also included are Bernaldo and Besner soils on mounds. These soils are better drained than Alazan soil. The included soils make up 20 percent of some mapped areas.

This Alazan soil is used mainly as woodland. Minor areas are used for improved pasture.

This soil is well suited to pine and high quality hardwoods, such as sweetgum and red oaks. Because of wetness, this soil has equipment limitations late in winter and early in spring. Pines grow well on this soil, but a proliferation of other plants results in moderate competition. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

Although only a few acres of this soil are used as cropland, this soil is well suited to crops, such as corn, and to some truck crops.

This soil is well suited to pasture and hayland grasses. Limiting features include seasonal wetness. Fertilizer, lime, and grazing management are necessary for the best production of adapted grasses, such as coastal bermudagrass, common bermudagrass, and improved bahiagrass. Some pastures are overseeded to legumes, such as white clover.

This soil is not suited to most orchard crops because of wetness.

This soil is poorly suited to urban uses and moderately suited to most recreational uses. Corrosivity to uncoated steel is a limitation. Wetness is a severe limitation for septic tank absorption fields, and low strength is a limitation for local roads and streets. Good design and installation are needed to overcome these problems.

This Alazan soil is in capability subclass IIw and in woodland ordination group 9W.

Ab—Alazan-Besner complex, gently undulating. This map unit consists of deep soils on terraces of the Angelina and Neches Rivers and many of the creeks throughout the county. The soils formed in wind-modified sediment. The mapped areas are mostly less than 100 acres.

Somewhat circular mounds and interwinding sinuous lows that serve as drainageways are characteristic of the landscape. The mounds rise 1.5 to 3.5 feet above the intermounds. Generally, the intermounds or lows comprise about 60 percent of the area. The Alazan soil, in intermounds, makes up from 45 to 65 percent of the map unit, and the Besner soil, on the mounds, makes up 35 to 55 percent.

Alazan soil has a very fine sandy loam surface layer about 19 inches thick. It is brown to a depth of 9 inches and pale brown from 9 to 19 inches. The subsoil to a depth of 60 inches is strong brown loam that has tongues of light brownish gray. Yellowish red mottles occur from 23 to 60 inches.

Besner soil has a fine sandy loam surface layer about 31 inches thick. It is brown to a depth of 11 inches and pale brown from 11 to 31 inches. The subsoil to a depth of 60 inches is strong brown loam that has light brownish gray stripped areas from 39 to 60 inches.

Included in mapped areas of these soils are small areas of Keithville soils that are more clayey in the lower part of the subsoil than the Alazan and Besner soils. Also included are areas of poorly drained Mollville soils in some deeper lows. The included soils make up less than 15 percent of the mapped areas.

Alazan and Besner soils have a high available water capacity and are moderately permeable. Alazan soil is somewhat poorly drained and Besner soil is well drained. Runoff is very slow and slow. Alazan soil is saturated late in winter and early in spring. It has a water table at a depth of 18 to 30 inches. Water may pond in some lows for short periods. Besner soil has a water table below a depth of 48 inches.

The soils making up this map unit are used mainly as woodland. Minor areas are used for improved pasture.

Both soils are well suited to the production of woodland products. Limiting features for Alazan soil include wetness late in winter and early in spring. These soils are well suited to the reestablishment of pine seedlings and to the production of woodland understory plants for use by livestock and wildlife.

None of the soils in this map unit are used for crops, but they are well suited to some crops and vegetables. Seasonal wetness is a limitation on Alazan soil.

These soils are well suited to pasture and hayland grasses. Fertilizer, lime, and grazing management are necessary for the best production of adapted grasses and legumes.

Alazan soil is not suited to most orchard crops because of wetness. Besner soil is well suited to peaches, plums, grapes, and blackberries.

Alazan soil is poorly suited to urban uses and moderately suited to recreational uses. Corrosivity to uncoated steel is a limitation. Wetness is a severe limitation for septic tank absorption fields, and low strength is a limitation for local roads and streets. Good design and installation are needed to overcome these problems. The Besner soil is well suited to urban and recreational uses.

The soils in this map unit are in capability subclass IIw. Alazan soil is in woodland ordination group 9W, and Besner soil is in woodland ordination group 9A.

AcB—Alazan-Urban land complex, 0 to 4 percent slopes. This complex of nearly level to gently sloping soils and Urban land is on broad stream terraces. It is about 55 percent Alazan soil, 30 percent Urban land, and 15 percent other soils. These soils and Urban land are so intricately mixed that separation is not practical at the scale used in mapping.

Typically, the surface layer of this Alazan soil is very fine sandy loam about 10 inches thick. It is mottled brown and dark gray in the upper part and it is light brownish gray with yellowish brown mottles in the lower part. The subsoil extends to a depth of 67 inches. To a depth of 26 inches, it is yellowish brown loam that has light brownish gray mottles, and to 47 inches, it is mottled strong brown, yellowish brown, and light gray loam. To a depth of 67 inches is mottled yellowish red, strong brown, and light brownish gray sandy clay loam. Reaction is strongly acid throughout. Alazan soil is somewhat poorly drained and moderately permeable.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that obscure the soil. Before some areas were covered, the soil was disturbed or part of the soil was removed with earth moving equipment. The Urban land is mainly drained through sewer systems, gutters, culverts, and surface ditches.

Included with these soils in mapping are small areas of Keltys, Fuller, and Kurth soils. Keltys soils are on slightly convex interstream divides and moderately steep side slopes. They have a less clayey subsoil than Alazan soils. Fuller soils are on slightly concave uplands and are somewhat poorly drained. Kurth soils are on slightly convex interstream divides and are moderately well drained.

The soil in this complex is poorly suited to most urban uses. Corrosivity to uncoated steel is a limitation. Wetness is a severe limitation for septic tank absorption fields, and low strength is a limitation for local roads and streets. Good design and installation are needed to overcome these problems.

This complex is not placed in a capability subclass or a woodland ordination group.

AtB—Attoyac fine sandy loam, 0 to 4 percent slopes. This deep soil consists of broad, nearly level and gently sloping terraces near the Angelina and Neches Rivers. This soil formed in old wind-blown sediment.

This soil has a dark brown fine sandy loam surface layer about 11 inches thick. The subsoil is sandy clay loam to a depth of 72 inches. It is a dark red to a depth of 48 inches and red with a few pale brown streaks below that.

Attoyac soil is well drained and moderately permeable. It has a high available water capacity. Runoff is slow. Water erosion is a slight hazard.

Included in mapped areas of this soil are Bernaldo soils that are in slightly concave spots. Also included are areas of similar soils that contain less clay in the subsoil than Attoyac soil. The included soils make up about 20 percent of the mapped area.

This Attoyac soil is used mainly as pasture and woodland.

Attoyac soil is well suited to the production of pines and hardwoods. The dominant trees are loblolly pine, red oak, and sweetgum. Planted slash pine do very well on this soil. This soil is among the better pine-producing soils in this area. It can be site prepared and planted with very few problems. Seedlings are easily established. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife. However, the rapid development of overstory plants and competition from these plants can reduce production.

Although only a few acres of this soil are used as cropland, the soil is well suited to crops, such as corn, and to many truck crops.

This soil is well suited to pasture and hayland grasses. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and Pensacola bahiagrass. Some pastures are overseeded to legumes, such as arrowleaf clover.

This soil is well suited to peaches, plums, pears, and blackberries.

This soil is well suited to urban and recreational uses. Low strength affecting roads and streets is a limiting feature that can be easily overcome.

This Attoyac soil is in capability subclass IIe and in woodland ordination group 9A.

AtD—Attoyac fine sandy loam, 8 to 15 percent slopes. This deep soil is on strongly sloping side slopes of old terraces immediately above some bottom land areas. It formed in old wind-modified sediment. The mapped areas are long and narrow.

This soil has a brown fine sandy loam surface layer about 6 inches thick. The subsoil is sandy clay loam to a depth of 65 inches. It is red to a depth of 27 inches and yellowish red below that. From 47 to 65 inches, the subsoil contains a few pale brown stripped areas.

This soil is well drained and moderately permeable. It has a high available water capacity. Runoff is medium to rapid, and erosion is a severe hazard.

Included in the mapped areas of this soil are Sacul soils and areas of Attoyac soils from which the surface has eroded. The included soils make up less than 15 percent of mapped areas.

This Attoyac soil is used mainly for improved pasture and as woodland.

This soil is well suited to the production of pines and hardwoods. The dominant trees are loblolly pine, red oak, and sweetgum. Planted slash pine do very well on this soil. This soil is among the better pine-producing soils in this area. It can be site prepared and planted with very few problems. Seedlings are easily established. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife. However, the rapid development of overstory plants and competition from these plants can reduce production.

At present, this soil is not used as cropland, but it can be used for crops, such as corn, and for some truck crops. Care must be taken to prevent erosion. Steeper slopes can limit the use of some farm equipment.

This soil is well suited to pasture and hayland grasses. Controlling erosion and brush on the slopes is a concern in management. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass. Some pastures are overseeded to legumes, such as arrowleaf clover.

This soil is not suited to most orchard crops because of the erosion hazard and equipment use limitations on slopes.

This soil is moderately suited to most urban and recreational uses. Slope and low strength as it affects local roads and streets are limitations that can be partly overcome by good design and installation.

This Attoyac soil is in capability subclass IVe and in woodland ordination group 9A.

BaB—Bernaldo fine sandy loam, 0 to 3 percent slopes. This deep soil is on broad, nearly level and gently sloping terraces near all major streams. It formed in old wind-modified sediment. Some areas have low mounds, especially those in virgin forest areas.

This soil has a fine sandy loam surface layer about 17 inches thick. It is grayish brown to a depth of 8 inches, brown from 8 to 12 inches, and pale brown from 12 to 17 inches. The subsoil, to a depth of 50 inches is strong brown loam. To a depth of 65 inches, it is yellowish brown sandy clay loam that has reddish brown and light gray mottles.

This soil is well drained and moderately permeable. It has a high available water capacity. Runoff is slow. Water erosion is a slight hazard. This soil is saturated at a depth of 4 to 6 feet late in winter and early in spring.

Included in mapped areas of this soil are slightly concave areas of Alazan soils that are wetter than Bernaldo soil. Also included are mounds of Besner soils that have a surface layer thicker than 20 inches. The included soils make up about 25 percent of any mapped area.

Most of this Bernaldo soil is used as pasture and woodland.

This soil is well suited to woodland production. It is one of the better pine-growing soils, and good quality red oak and sweetgum also grow on this soil. The fine sandy loam surface layer underlain by the loam and sandy clay loam subsoil makes the root zone and water holding capacity excellent for tree growth. This soil can be logged almost anytime of the year with minimum problems. It is also well suited to the production of woodland understory plants for use by livestock and wildlife. However, the rapid development of overstory plants and competition from these plants can reduce production.

Although only a few acres of this soil are used as cropland, the soil is well suited to crops, such as corn, and to some truck crops.

This soil is well suited to pasture and hayland grasses. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as crimson clover.

This soil is well suited to peaches, plums, pecans, and blackberries.

This soil is moderately suited to urban uses and well suited to recreational uses. Wetness and moderate shrink-swell potential are limitations for urban uses. Low strength is a limitation to local roads and streets. These problems can be overcome with good design and proper installation.

This Bernaldo soil is in capability subclass IIe and in woodland ordination group 9A.

Bb—Bernaldo-Besner complex, gently undulating. These deep soils are on broad, nearly level, mounded terraces. They formed in old wind-modified sediment. The mapped areas are mainly less than 200 acres.

Somewhat circular mounds and interwinding sinuous low areas are characteristic of the landscape. The mounds are 2 to 4 feet above the lows and are 55 to 225 feet wide. The lows are continuous in length, but only 30 to 80 feet wide. The Bernaldo soil in the low areas makes up from 40 to 65 percent of the map unit, and Besner soil on the mounds makes up from 30 to 55 percent.

Bernaldo soil has a fine sandy loam surface layer about 11 inches thick. The surface layer is brown to a depth of 6 inches and pale brown below that. The subsoil is loam to a depth of 65 inches. It is strong brown to a depth of 33 inches and strong brown with yellowish red and light gray mottles below that.

Besner soil has a fine sandy loam surface layer about 26 inches thick. The surface layer is dark brown to a depth of 8 inches, brown from 8 to 18 inches, and pale brown from 18 to 26 inches. The subsoil is loam to a depth of 80 inches. To a depth of 65 inches, it is yellowish brown with streaks of pale brown, and below that, it is strong brown with light gray mottles.

Bernaldo and Besner soils are well drained and moderately permeable. They have a high available water capacity. Runoff is slow because of the long, connected lows. Water erosion is a slight hazard. These soils are saturated late in winter and early in spring. They have a water table below a depth of 4 feet.

Included in some of the mapped areas are Alazan soils in microdepressions. The Alazan soils are grayer than the Bernaldo soil. They make up less than 25 percent of the total acreage.

The soils in this map unit are used mainly as pasture and woodland.

The soils are well suited to the production of woodland products. They have an excellent plant-moisture relationship and are equally suited to pines and hardwoods. The soils are well suited to the production of woodland understory plants for use by livestock and wildlife.

At present, the soils in this map unit are not used for crops, but they are well suited to some crops and vegetables.

The soils are well suited to pasture and hayland grasses. Fertilizer, lime, and grazing management are necessary for the best production of adapted grasses and legumes, such as coastal bermudagrass and crimson clover.

These soils are well suited to orchard crops.

Besner soil is well suited to urban and recreational uses. Bernaldo soil is moderately suited to urban uses and well suited to recreational uses. Wetness and the shrink-swell potential are limiting features for urban uses. Low strength is a limitation for local roads and streets. These problems can be overcome with good design and proper installation.

The soils in this map unit are in capability subclass IIe and in woodland ordination group 9A.

BnB—Bienville loamy fine sand, 0 to 5 percent slopes. This deep soil is on lower terraces mainly adjacent to the bottom lands of the Angelina and Neches Rivers. Most areas of this soil were deposited on the inside curve of old stream meanders. The mapped areas of this soil are oblong, and mostly less than 50 acres.

This soil is loamy fine sand to a depth of about 80 inches. It is dark brown to a depth of 7 inches and yellowish brown from 7 to 20 inches. The next layer, from 20 to 50 inches, is strong brown with thin layers of yellowish red. To a depth of 80 inches, it is strong brown with very pale brown and yellowish red splotches.

This soil has a fluctuating water table between depths of 4 and 6 feet during winter and early in spring. The soil is somewhat excessively drained and moderately rapidly permeable. The available water capacity is medium. Runoff is slow. Water erosion is a slight hazard. Some areas of this Bienville soil are subject to overflow once in 20 to 100 years.

Included in mapped areas of this soil are areas of a soil that has a reddish fine sandy loam subsoil. Also included are various soils in old stream channels that are wetter than Bienville soil. The included soils make up less than 15 percent of the mapped areas.

This Bienville soil is used mainly as woodland. Small areas are used for improved pasture.

Bienville soil is too droughty for hardwoods, but it can be managed for pine production. Loblolly pine is well suited to this soil. Slash pine grows on this soil but is more susceptible to *fomes annosus* because of the soil's sandy texture. This soil is suited to the production of woodland understory plants for use by livestock and wildlife. Plant competition from the overstory, however, reduces production.

Although only a few acres of this soil are used as cropland, the soil is well suited to crops, such as corn, and to some truck crops, especially watermelons. Drought reduces yields in some years.

This soil is well suited to pasture and hayland grasses. Limiting features include droughtiness of the sandy surface layer. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass, common bermudagrass, and improved bahiagrass. Some pastures are overseeded to legumes, such as vetch and arrowleaf clover.

This soil is suited to peaches, pecans, and pears. Low available moisture in summer months lowers production in most years.

This soil is well suited to urban and recreational uses. Wetness and caving of cutbanks in excavation are limiting features that can be overcome with good design and installation. The sandy surface is a limiting feature for recreational uses.

This Bienville soil is in capability subclass IIs and in woodland ordination group 9S.

BrC—Browndell fine sandy loam, 2 to 5 percent slopes. This shallow soil is on gently sloping uplands, mainly on smooth, lower slopes. It is underlain by the Catahoula Formation. The mapped areas are less than 40 acres.

This soil has a fine sandy loam surface layer about 9 inches thick. It is dark grayish brown to a depth of 5 inches and light brownish gray from 5 to 9 inches. The subsoil extends to a depth of 16 inches. It is grayish brown clay that contains bits of tuffaceous mudstone in the lower part. The underlying material is weakly consolidated tuffaceous material.

Areas of this soil are somewhat poorly drained. Runoff is medium. Erosion is a severe hazard. The available water capacity is very low.

Included in mapping are small spots covered with boulders and areas of exposed tuffaceous siltstone. Also included are small areas of Corrigan soils that are more deeply developed than Browndell soil. The included soils make up less than 5 percent of the mapped areas.

Because this Browndell soil has severe limitations for most uses, almost all of the acreage is used as woodland. Although this soil is poorly suited to woodland production, it generally has a scattered stand of longleaf pines (fig. 11). It is difficult to get a fully stocked stand of pines on this soil. Production of loblolly pine will likely be 60 board feet per acre per year. This soil should never be clean site prepared. The fragile nature of this soil requires a good cover at all times. Pine can best be established by natural reseeding or underplanting and release. This soil is suited to the production of woodland understory plants for use by livestock and wildlife. However, the available moisture, soil depth, and rocks can reduce production.

This soil is poorly suited to crops, and it is not used as cropland.

This soil is poorly suited to pasture and hayland grasses. The shallow soil depth, erosion hazard, and very low available moisture are limitations. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as common bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as arrowleaf clover. Because of the condition of this soil, pastures should be seeded rather than sprigged.

This soil is not suited to orchard crops because it is so shallow.

This soil is poorly suited to urban and recreational uses. Depth to rock and very slow permeability are severe limitations for septic tank absorption fields, building sites, roads and streets, and recreation areas. High shrink-swell potential and high corrosivity to

Figure 11.—A thin stand of longleaf and shortleaf pine in an area of Browndell fine sandy loam, 2 to 5 percent slopes. This soil is poorly suited to most uses.

uncoated steel and concrete are other limiting features. Proper design and installation are essential to overcome the limitations of this soil, but they are costly.

This Browndell soil is in capability subclass IVe and in woodland ordination group 5D.

BrD—Browndell fine sandy loam, 5 to 15 percent slopes. This shallow soil is on moderately steep side slopes. The mapped areas are mostly less than 40 acres.

This soil has a dark grayish brown fine sandy loam surface layer about 4 inches thick. The subsoil, to a depth of 16 inches, is grayish brown clay. From 12 to 16 inches, it contains pieces of volcanic tuff. The underlying material to a depth of 20 inches is weakly consolidated tuffaceous material.

This soil is somewhat poorly drained and very slowly permeable. Runoff is rapid. Erosion is a severe hazard. The available water capacity is very low.

Included in mapped areas are small spots covered with boulders. Also included are a few long side slopes of Kisatchie soils that are deeper than Browndell soil. The included soils make up about 10 percent of the mapped areas.

Because of the severe limitations for other uses, this soil is used almost entirely as woodland. Many areas have only a sparse cover of longleaf pine but have a dense cover of bluestems, panicums, and paspalums.

Although this soil is poorly suited to woodland production, it generally has a scattered stand of longleaf pines. It is difficult to get a fully stocked stand of pines on this soil. Production of loblolly pine will likely be 60 board feet per acre per year. This soil should never be clean site prepared. The fragile nature of this soil requires a good cover at all times. Pine can best be established by natural reseeding or underplanting and release. This soil is suited to the production of woodland understory plants for use by livestock and wildlife. However, the shallow rooting depth and very low available moisture can reduce production.

This soil is not suited to crops, and it is not used as cropland. The shallow depth and erosion hazard are limitations.

This soil is not suited to pasture and hayland grasses. Limiting features include the erosion hazard, equipment limitations on steeper slopes, and the very low available water capacity.

This soil is not suited to orchard crops because it is so shallow.

This soil can be used for some urban and recreational uses, but it will be costly to overcome the shallow depth to bedrock, very slow permeability, and slope. High shrink-swell potential, high corrosivity to uncoated steel and concrete, and erodibility are other limiting features. Proper design and installation can overcome some of the limitations of this soil.

This Browndell soil is in capability subclass VIe and in woodland ordination group 5D.

CoB—Corrigan fine sandy loam, 1 to 5 percent slopes. This moderately deep soil is on gently sloping low ridges and concave side slopes. It is underlain by the well-dissected Catahoula Formation. The heads of many small drainageways are in this map unit (fig. 12).

This soil has a fine sandy loam surface layer about 6 inches thick that is dark gray to a depth of 5 inches and grayish brown from 5 to 6 inches. The subsoil is clay to a depth of 39 inches. It is mottled grayish brown and dark grayish brown to a depth of 10 inches, and it is grayish brown to a depth of 33 inches. To a depth of 39 inches, it is light olive gray with a few light gray mottles. The underlying material to a depth of 60 inches is olive gray and pale olive tuffaceous siltstone.

This soil is somewhat poorly drained and very slowly permeable. Runoff is rapid. Erosion is a moderate hazard. The available water capacity is low. This soil has a perched water table during the winter.

Included in mapped areas are convex spots of Rayburn soils that have a reddish subsoil. Also included are small areas of Browndell soils that are shallow over volcanic tuff. The included soils make up less than 5 percent of mapped areas.

This Corrigan soil is used entirely as woodland. Understory plants are scarse because most areas of this soil have burned often. These areas have a dense stand of grasses under longleaf pines.

This soil is moderately suited to pine and hardwood. Longleaf pine is dominant; however, loblolly and slash pines are also suited. Some longleaf and loblolly pine on this soil grow 75 feet in height in 50 years. During wet periods, logging can be a problem. The soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is poorly suited to crops, and it is not used as cropland. Wetness is the main limitation.

This soil is moderately suited to pasture and hayland grasses. Limiting features include wetness late in spring and the sticky and plastic, clayey subsoil. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as arrowleaf clover.

Generally, this soil is not suited to orchard crops because of wetness and the clay subsoil.

The Corrigan soil is poorly suited to urban and recreational uses. Depth to rock, the high water table, and very slow permeability are severe limitations for septic tank absorption fields, building sites, and recreation areas. High shrink-swell potential and high corrosivity to uncoated steel and concrete are other limiting features. Proper design and installation are essential to overcome the many limitations of this soil, but they are costly.

This Corrigan soil is in capability subclass IIIw and in woodland ordination group 8C.

CtD—Cuthbert fine sandy loam, 5 to 15 percent slopes. This deep soil is in strongly sloping areas immediately above, but leading to, the major drainageways. It also is on large hills that tend to be gravelly near the crown. The mapped areas are long and narrow and parallel the bottom land for several miles. They average about 85 acres.

This soil has a fine sandy loam surface layer about 9 inches thick. It is dark brown to a depth of 5 inches and pale brown from 5 to 9 inches. The subsoil, to a depth of 18 inches, is red clay and, to a depth of 33 inches, is yellowish red clay loam. To a depth of 37 inches, it is yellowish red partly weathered sandstone and grayish brown partly weathered shale. The underlying material to a depth of 60 inches is alternate layers of yellowish red soft sandstone and grayish brown shale.

This soil is well drained and moderately slowly permeable. It has a medium available water capacity. Runoff is rapid. Water erosion is a severe hazard.

Included in mapped areas of this soil are Kirvin soils in gently sloping areas at the top of slopes. Kirvin soils are gravelly and are more deeply developed than Cuthbert soil. Also included are Tenaha and Sacul soils. The Tenaha soils are on the lower part of some slopes and have a sandy surface layer more than 20 inches thick.

Figure 12.—Pitcher plants adapt well to the environment in the head of a drainageway in an area of Corrigan fine sandy loam, 1 to 5 percent slopes.

The Sacul soils are at the head of drainageways. They are more clayey than Cuthbert soil, and the subsoil is mottled red and gray. Also included are areas of Cuthbert soils that have slopes ranging to 35 percent. The included soils make up less than 20 percent of the mapped areas.

This Cuthbert soil is used almost entirely as woodland. It is moderately suited to pine, but poor quality hardwoods will grow. A properly stocked stand of loblolly pine managed correctly can produce about 130 board feet per acre per year. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is not suited to crops, and is not used as cropland. The erosion hazard is a limitation.

This soil is moderately suited to pasture and hayland grasses. Limiting features include the erosion hazard caused by the steepness of slope. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass. Some pastures are overseeded to legumes, such as crimson clover and vetch.

This soil is not suited to most orchard crops because of the steepness of slope.

This soil is moderately suited to most urban and recreational uses. It is corrosive to uncoated steel and concrete. Slope, moderately slow permeability, low strength affecting roads and streets, and shrink-swell potential are other limiting features. These limitations can be partly overcome with good design and installation.

This Cuthbert soil is in capability subclass VIe and in woodland ordination group 8C.

CtF—Cuthbert fine sandy loam, 15 to 35 percent slopes. This moderately deep soil is on moderately steep to steep breaks mainly into the bottom land of the Angelina River. The mapped areas are long and narrow and parallel the river for long distances. Outcrops of stones are on some escarpments.

This soil has a brown fine sandy loam surface layer about 6 inches thick. It contains about 5 percent gravel. The subsoil, to a depth of 16 inches, is red clay. It is yellowish red clay loam to a depth of 25 inches and yellowish red sandy clay loam to a depth of 28 inches. The underlying material is strong brown soft sandstone that contains thin layers of gray shale.

This soil is well drained and moderately slowly permeable. It has a medium available water capacity. Runoff is very rapid. Water erosion is a very severe hazard.

Included in mapped areas of this soil are small areas of very steep slopes that are covered with large boulders. Also included are spots where the entire surface layer has been removed by erosion and some areas of gravelly soils. The included soils make up 15 to 20 percent of the mapped areas.

This Cuthbert soil is used mainly as woodland and is moderately suited to this use. Because of the steepness of the slope and the runoff potential, care should be taken before any mechanical practices are used on this soil. Site preparation should be avoided. On areas already clearcut, windrows and planted seedlings need to be on the slope contour. To avoid soil disturbance, logging should be during dry periods. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is not suited to crops, and it is not used as cropland. The erosion hazard on steep slopes is the main limitation.

This soil is not suited to pasture and hayland grasses. Limiting features include the steepness of slope, the erosion hazard, and the equipment use limitations on steep slopes.

This soil is not suited to most orchard crops. Steepness of slope is the main limitation.

This soil is poorly suited to most urban and recreational uses. It is highly corrosive to uncoated steel and concrete. Steep slopes, moderately slow permeability, low strength affecting roads and streets, and shrink-swell potential are other limiting features. Proper design and installation to overcome some of these limitations will be costly.

This Cuthbert soil is in capability subclass VIIe and in woodland ordination group 6R.

CuD—Cuthbert gravelly fine sandy loam, 8 to 15 percent slopes. This moderately deep soil is in strongly sloping areas immediately above, but leading to, the major drainageways. Some areas are highly convex hills. The mapped areas are long and narrow are mostly less than 50 acres.

This soil typically has a gravelly fine sandy loam surface layer about 7 inches thick. It is brown to a depth of 4 inches and pale brown from 4 to 7 inches. The surface layer contains 15 to 25 percent gravel. The subsoil, to a depth of 23 inches, is clay. It is red to a depth of 19 inches, and to a depth of 23 inches, it is yellowish red with streaks of strong brown. The lower part of the subsoil is layered yellowish red and pale brown clay loam to a depth of 27 inches. The underlying material is yellowish red sandstone that has thin layers of gray shale.

Runoff is rapid on this soil, and water erosion is a severe hazard. This soil is well drained and moderately slowly permeable. It has a medium available water capacity.

Included in mapped areas of this soil are small areas of Kirvin soils on the top of some ridges. Also included are Sacul soils and areas of Cuthbert soils that have slopes of up to 35 percent. The included soils make up less than 20 percent of the mapped areas.

This Cuthbert soil is used mainly as woodland. It is moderately suited to pine, and can produce 130 board feet per acre per year of loblolly pine under good management. The clay content of the soil makes logging in wet weather undesirable. Droughtiness caused by the gravel content of the surface layer is a limitation. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is not suited to crops, and it is not used as cropland. Steepness of slope is the main limitation.

This soil is moderately suited to pasture and hayland grasses. Limiting features include droughtiness and the erosion hazard. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and common bermudagrass. Some pastures are overseeded to legumes, such as vetch and crimson clover.

This soil is not suited to most orchard crops because of steepness of slope and the gravel content.

This soil is moderately suited to most urban and recreational uses. It is highly corrosive to uncoated steel and concrete. Slope, moderately slow permeability, low strength affecting roads and streets, and shrink-swell potential are other limiting features. Small stones affect some recreation uses. These limitations can be partly overcome with good design and installation.

This Cuthbert soil is in capability subclass VIe and in woodland ordination group 6F.

DaC—Darco loamy fine sand, 1 to 8 percent slopes. This deep soil is on wide interstream divides that are part of the highest landscape in the county. Because of the lack of runoff, very few drains are in this map unit. Generally, this soil is between Lufkin and Central and

near Zavalla. The mapped areas are mainly slightly convex and are about 50 acres.

This soil has a loamy fine sand surface layer about 55 inches thick. It is very dark grayish brown to a depth of 6 inches and yellowish brown from 6 to 55 inches. The subsoil to a depth of 80 inches is red sandy clay loam that has light brownish gray streaks in the lower part.

This soil is somewhat excessively drained and moderately permeable. It has a low available water capacity. The sandy surface layer is droughty. Runoff is slow. Water erosion is a moderate hazard.

Included in mapped areas of this soil are Lilbert soils on convex knobs or ridges. Lilbert soils have a sandy surface layer less than 40 inches thick. These soils make up less than 15 percent of the mapped area.

This Darco soil is used mainly as woodland and is moderately suited to this use. It is generally droughty and is best suited to pines rather than hardwoods. In clearcut and site-prepared areas, seedling mortality is severe because of the low available water in the soil surface layer. Seedlings will survive better if planted under the protective cover of other trees. These older trees can later be controlled by mechanical or chemical methods. Woodland production varies greatly on this soil because of the variations in the thickness of the sandy surface layer and moisture on different parts of the slope. Generally, the lower slopes are better sites for woodland than the upper slopes. This soil is moderately suited to the production of woodland understory plants for use by livestock and wildlife. The low available moisture content of the surface layer reduces production.

This soil is poorly suited to most crops, such as corn, and to some truck crops. However, this soil is well suited to watermelons. Only a few acres are used as cropland.

This soil is poorly suited to pasture and hayland grasses. Limiting features include low available moisture and low natural fertility. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and weeping lovegrass.

This soil is not suited to most orchard crops. The low available water capacity is a limitation.

This soil is moderately suited to urban and recreational uses. Seepage is a limiting feature for sanitary facilities. Caving of cutbanks in excavation and the sandy surface are other limiting features. Slope will limit some recreational uses.

This Darco soil is in capability subclass IIIs and in woodland ordination group 8S.

DaD—Darco loamy fine sand, 8 to 15 percent slopes. This deep soil is in strongly sloping areas that parallel drainageways for long distances. This soil generally is between Lufkin and Central and near Zavalla. Many springs are at the base of some slopes of this soil. The mapped areas are long and narrow and about 50 acres.

This soil has a loamy fine sand surface layer about 57 inches thick. It is dark grayish brown to a depth of 3 inches, brown from 3 to 7 inches, and pale brown from 7 to 57 inches. To a depth of 80 inches, the subsoil is yellowish red sandy clay loam that has pale brown mottles.

This soil is somewhat excessively drained and moderately permeable. It has a low available water capacity. The sandy surface layer is droughty. Runoff is medium to rapid. Water erosion is a severe hazard.

Included in mapped areas of this soil are ridges of Tenaha soils that have a sandy surface layer less than 40 inches thick. Also included are the slightly wet Rentzel soils on the bottom or lowest part of the slope. The included soils make up less than 20 percent of the mapped areas.

Most areas of this Darco soil are in a forest. Very few acres are cleared for use as pasture.

This soil is moderately suited to woodland products. It is generally droughty and is best suited to pines rather than hardwoods. In clearcut and site-prepared areas, seedling mortality is severe because of the low available water capacity. Seedlings survive better if planted under the protective cover of other trees. These older trees can later be controlled by mechanical or chemical methods. Woodland production varies greatly on these soils because the variations in the thickness of the sandy surface layer and moisture on different parts of the slope. Generally, the lower slopes are better sites for woodland than the upper slopes. This soil is moderately suited to the production of woodland understory plants for use by livestock and wildlife. The low available water capacity of the surface layer reduces production.

This soil is not suited to most crops, and it is not used as cropland. The erosion hazard is the main limitation.

This soil is poorly suited to pasture and hayland grasses. Limiting features include the low available moisture and natural low fertility. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and weeping lovegrass.

This soil is not suited to most orchard crops. The low available water capacity is the main limitation.

This soil is moderately suited to most urban and recreational uses. Seepage is a limiting feature for sanitary facilities. Other limitations are slope, caving of cutbanks in excavation, and the sandy surface.

This Darco soil is in capability subclass VIe and in woodland ordination group 8S.

DbA—Diboll very fine sandy loam, 0 to 1 percent slope. This deep soil is in nearly level, slightly concave areas. Many areas of this soil are on lower slopes and may flood on rare occasions for short durations. In most years the soil is saturated during the cool season. Hundreds of crayfish holes and mounds are in pasture

and hayland fields. The mapped areas are generally more than 50 acres and may be several hundred acres.

This soil typically has a very fine sandy loam surface layer about 27 inches thick. It is grayish brown to a depth of 5 inches, light brownish gray from 5 to 12 inches, and from 12 to 27 inches, it is light brownish gray with strong brown and light gray streaks. The subsoil to a depth of 42 inches is light brownish gray loam that has dark grayish brown to black streaks of loam and clay loam. Crayfish holes have dark clay loam cups. The underlying material is olive, mildly alkaline mudstone.

Diboll soil is somewhat poorly drained and very slowly permeable. The available water capacity is medium. Runoff is very slow and erosion is a slight hazard. This soil is saturated at a depth of 6 to 18 inches late in winter and early in spring. In pasture areas, a third of the soil surface may be crayfish mounds in different stages of deterioration.

Included in mapped areas are low mounds of Keltys soils and small clayey spots of Herty soils. Also included are a few slick spots presumed to have a high concentration of salts. The included soils make up less than 10 percent of mapped areas.

This Diboll soil is used equally as pasture and woodland.

This soil is moderately suited to the production of pine and hardwood. When managed properly, native stands of loblolly pine are high producers of good quality timber. However, after clearing and site preparation, many areas are difficult to reestablish with nursery pine seedlings. Natural regeneration of pine trees is suggested. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife; however, wetness can reduce production.

Although only a few acres of soil is used as cropland, the soil is moderately suited to crops, such as corn, and to some truck crops.

This soil is moderately suited to pasture and hayland grasses. Limiting features include soil wetness late in winter and early in spring. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as white clover or ball clover.

This soil is not suited to most orchard crops because of wetness late in winter and early in spring.

This soil is poorly suited to urban and recreational uses. High corrosivity is a limiting feature to uncoated steel and concrete. The seasonal high water table and very slow permeability are severe limitations for septic tank absorption fields, building sites, roads and streets, and recreation areas. Excess sodium is also a limiting feature for recreation areas. Proper design and installation to partly overcome these limitations are costly.

This Diboll soil is in capability subclass IIIw and in woodland ordination group 8W.

DbB—Diboll very fine sandy loam, 1 to 4 percent slopes. This deep soil is on gently sloping, slightly concave, broad interstream divides. In most years, the soil is saturated during the cool season. Hundreds of crayfish holes and mounds are in pasture and hayland fields (fig. 13). Most mapped areas are more than 100 acres and may be several hundred acres.

This soil is typically very fine sandy loam to a depth of 29 inches. It is grayish brown to a depth of 9 inches and light brownish gray with strong brown mottles below that. To a depth of 43 inches, the soil is mottled light brownish gray and light yellowish brown clay loam that has tongues of light gray loam. Crayfish holes have cups of dark gray clay loam. The underlying material is light olive brown and pale olive, neutral siltstone.

Diboll soil is somewhat poorly drained and very slowly permeable. The available water capacity is medium. Runoff is slow, and erosion is a moderate hazard. This soil is generally saturated long enough to delay planting in the spring. A water table is within 6 inches of the soil surface late in winter and early in spring. More than 1,000 crayfish mounds per acre are on the surface in some places.

Included in mapped areas are Keltys soils on low mounds, small spots of clayey Herty soils, and Rosenwall soils in low, convex areas. Also included are a few gleyed areas, probably having a high concentration of salts. Generally, the included soils make up less than 10 percent of mapped areas.

This Diboll soil is used equally as pasture and woodland.

This soil is moderately suited to the production of pine and hardwood. When managed properly, native stands of loblolly pine are high producers of good quality timber. However, after clearing and site preparation, many areas are difficult to reestablish with nursery pine seedlings. Natural regeneration of pine trees is suggested. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife; however, wetness can reduce production.

Although only a few acres of this soil are used as cropland, the soil is moderately suited to crops, such as corn, and to some truck crops.

This soil is moderately suited to pasture and hayland grasses. Limiting features include wetness late in winter and early in spring. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as singletary peas.

This soil is not suited to most orchard crops because of wetness late in winter and early in spring.

This soil is poorly suited to urban and recreational uses. High corrosivity is a limitation to uncoated steel and concrete. The seasonal high water table and very slow permeability are severe limitations for septic tank absorption fields, building sites, roads and streets, and

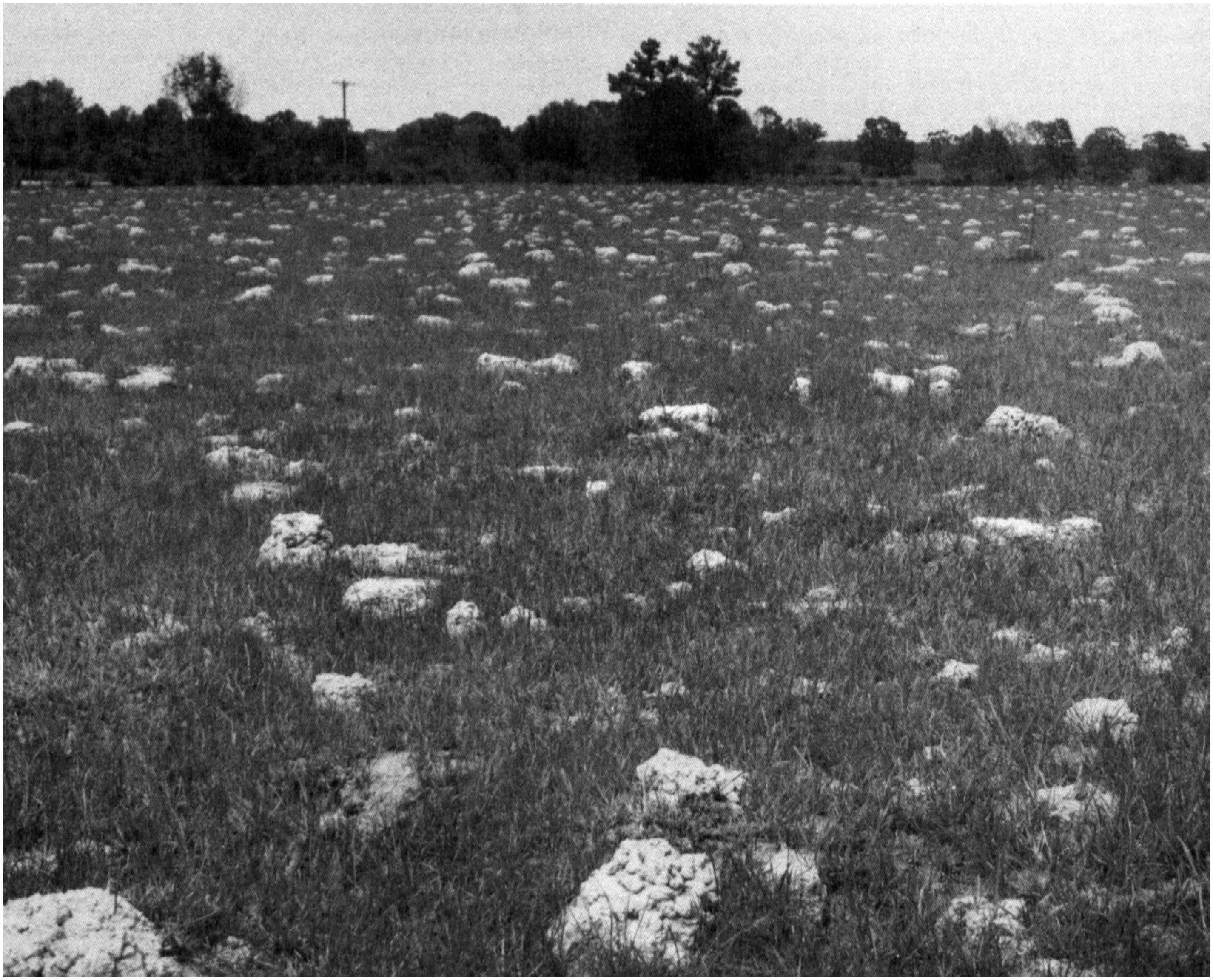


Figure 13.—Crayfish mounds cover a pasture in an area of Diboll very fine sandy loam, 1 to 4 percent slopes.

recreation areas. Excess sodium is also a limiting feature for recreation areas. Proper design and installation to partly overcome these limitations are costly.

This Diboll soil is in capability subclass IIIe and in woodland ordination group 8W.

Du—Dumps. This map unit consists of areas previously used as sanitary landfill sites. Originally, pits were dug in these areas and filled with refuse of all types. These areas were systematically covered with soil material. The resulting material is a mixture of soil and different household garbage. The final covering over these areas is mostly soil that has 15 to 20 percent refuse material. In many cases, this results in a compacted surface that is highly erodible and in some cases difficult to vegetate.

Generally these old dump sites settle and the surface erodes, resulting in an area that has lows and highs. The surface has small rills caused by water erosion. Weeds are first to cover the site, and then generally hardwood shrubs are naturally established.

This map unit is not placed in a capability subclass or in a woodland ordination group.

EtB—Etoile loam, 1 to 5 percent slopes. This deep soil is on gently sloping, broad ridges. These soils are

mainly in the Caddell and Cook Mountain Formations. In most areas, the surface is irregular and has small humps or gilgai. The mapped areas average 50 acres.

This soil typically has a loam surface layer about 5 inches thick. It is dark grayish brown to a depth of 3 inches and pale brown below that. The subsoil is plastic clay. It extends to a depth of 47 inches. To a depth of 9 inches, it is yellowish red with light gray mottles. It is mottled yellowish red, brown, and light gray to a depth of 27 inches, and below that, it is olive with pale olive mottles. The underlying material is light olive brown and gray platy clay. The soil becomes calcareous at a depth of 27 inches.

Etoile soil is somewhat poorly drained and very slowly permeable. It has a medium available water capacity. Runoff is medium. Water erosion is a moderate hazard.

Included in mapped areas of this soil are small areas of Woodtell soils and some Etoile soils that have slope of more than 5 percent. Also included are small areas of Naclina soils that have a clayey surface layer. The included soils make up less than 20 percent of mapped areas.

This Etoile soil is used mainly as woodland and is moderately suited to pine and hardwoods. Although this soil is not one of the better timber soils in the county, it will produce quality timber if managed properly. Natural reproduction on this soil is generally prolific. Larger trees tend to have crooked trunks because of the high shrink-swell potential of the sticky and plastic, clayey subsoil. The clayey subsoil also causes difficulties in planting pine seedlings. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

Although only a few acres of this soil are used as cropland, the soil is moderately suited to crops, such as corn, and to some truck crops.

This unit is moderately suited to pasture and hayland grasses. Limiting features include the clayey subsoil, the thin surface layer, and wetness early in spring. Fertilizer and grazing management are needed for the best production of adapted grasses, such as common bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as arrowleaf clover.

This soil is not suited to most orchard crops because of the clayey subsoil.

This soil is poorly suited to urban uses and is suited to recreational uses. Corrosivity is a limitation to uncoated steel. Wetness and very slow permeability are severe limitations for septic tank absorption fields, building sites, roads and streets, and recreation areas. The high shrink-swell potential resulting from changes in moisture affects building sites and roads and streets. Proper design and installation needed to partly overcome these limitations can be costly.

This Etoile soil is in capability subclass IIIe and in woodland ordination group 7C.

FfA—Fuller fine sandy loam, 0 to 1 percent slope. This deep soil is on nearly level, slightly concave, lower slopes. This soil floods on rare occasions for short durations. In most years, the soil is saturated during the cool season. Hundreds of crayfish holes and mounds are in pasture and hayland fields. The mapped areas average about 45 acres.

The soil typically has a fine sandy loam surface layer about 28 inches thick. It is grayish brown to a depth of 5 inches and is light brownish gray from 5 to 28 inches. Dark gray clay cups are in crayfish holes from 11 to 28 inches. The subsoil extends to a depth of 35 inches. It is grayish brown loam and light gray fine sandy loam, and it has dark gray clayey material in cracks. Voids in the cracks are filled with light gray loam. Crayfish holes have cups of dark gray clay loam. The underlying material is olive, mildly alkaline siltstone.

Fuller soil is somewhat poorly drained and very slowly permeable. Runoff is very slow, and erosion is a slight hazard. This soil is subject to flooding of short duration on rare occasions. It has medium available water capacity and is saturated late in winter and early in spring.

Included in mapped areas are Keltys soils on low mounds, and small, clayey spots of Herty soils. Also included are a few slick spots presumed to have a high concentration of sodium salts. The included soils make up less than 10 percent of mapped areas.

This Fuller soil is used equally as pasture and woodland.

This soil is moderately suited to the production of pine and hardwood. When managed properly, native stands of loblolly pine are high producers of good quality timber. However, after clearing and site preparation, many areas are difficult to reestablish with nursery pine seedlings. Natural regeneration of pine trees is needed. This soil exhibits characteristics associated with soils having high salt concentrations. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife; however, wetness can reduce production.

Although only a few acres of this soil are used as cropland, the soil is moderately suited to crops, such as corn, and to some truck crops.

This soil is moderately suited to pasture and hayland grasses. Limiting features include wetness late in winter and early in spring. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as white clover and singletary peas.

This soil is not suited to most orchard crops because it is saturated late in winter and early in spring.

This soil is poorly suited to urban and recreational uses. High corrosivity is a limitation for uncoated steel and concrete. The seasonal high water table and very slow permeability are severe limitations for septic tank

absorption fields, building sites, roads and streets, and recreation areas. Excess sodium is also a limiting feature for use for recreation areas. Proper design and installation to partly overcome these limitations are costly.

This Fuller soil is in capability subclass IIIw and in woodland ordination group 8W.

FfB—Fuller fine sandy loam, 1 to 4 percent slopes. This deep soil is on gently sloping, slightly concave, broad interstream divides. In most years, the soil is saturated during the cool season. Hundreds of crayfish holes and mounds are in pasture and hayland fields. Most mapped areas are more than 150 acres and may be several hundred acres.

This soil typically has a fine sandy loam surface layer about 39 inches thick. It is dark grayish brown or grayish brown to a depth of 24 inches, light brownish gray from 24 to 34 inches, and light gray from 34 to 39 inches. Dark waves of more clayey material occur at all depths. The subsoil is pale olive silty clay loam and light gray loam to a depth of 47 inches. Crayfish holes have cups of dark gray clay loam. The underlying material is pale olive, mildly alkaline to moderately alkaline siltstone. The siltstone is fractured in the upper part. These cracks are filled with dark, more clayey material.

Fuller soil is somewhat poorly drained and very slowly permeable. The available water capacity is medium. Runoff is slow, and erosion is a moderate hazard. This soil is generally saturated long enough to delay planting in the spring.

Included in mapped areas are Keltys soils on low mounds, small clayey spots of Herty soils, and Rosenwall soils in small, convex areas. Also included are a few slick spots presumed to have a high concentration of sodium salts. The included soils make up about 15 percent of mapped areas.

This Fuller soil is used equally as pasture and woodland.

This soil is moderately suited to the production of pine and hardwood. When managed properly, native stands of loblolly pine are high producers of good quality timber. Well managed stands can produce 500 to 600 board feet per acre per year. However, after clearing and site preparation, many areas are difficult to reestablish with nursery pine seedlings. Natural regeneration of pine trees is needed. This soil exhibits characteristics associated with soils having high salt concentrations. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife; however, wetness can reduce production.

Although only a few acres of this soil are used as cropland, the soil is moderately suited to crops, such as corn, and to some truck crops.

This soil is moderately suited to pasture and hayland grasses. Limiting features include wetness late in winter and early in spring. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as singletary peas.

This soil is not suited to most orchard crops. The saturated condition late in winter and early in spring is a limitation.

This soil is poorly suited to urban and recreational uses. High corrosivity to uncoated steel and concrete is a limitation. The seasonal high water table and very slow permeability are severe limitations for septic tank absorption fields, building sites, roads and streets, and recreation areas. Excess sodium is also a limiting feature for recreation areas. Proper design and installation to partly overcome these limitations are costly.

This Fuller soil is in capability subclass IIIe and in woodland ordination group 8W.

FuB—Fuller-Urban land complex, 1 to 4 percent slopes. This complex of gently sloping Fuller soil and Urban land is on slightly concave to smooth uplands. It is about 50 percent Fuller soil, 35 percent Urban land, and 15 percent other soils. This Fuller soil and Urban land are so intricately mixed that separation is not practical at the scale used in mapping.

Typically, this Fuller soil has a fine sandy loam surface layer about 23 inches thick. It is dark grayish brown in the upper part and grayish brown with strong brown mottles in the lower part. The subsoil is clay loam to a depth of 42 inches. It is light brownish gray in the upper part and light yellowish brown in the lower part. The subsoil has pockets of light gray silty material throughout. Crawfish burrows are common throughout the surface and subsoil layers. The underlying material is siltstone. Reaction is very strongly acid in the surface layer and neutral in the subsoil. Fuller soil is somewhat poorly drained and very slowly permeable.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that identification is not feasible. The Urban land areas of this complex are drained mainly through sewer systems, gutters, culverts, and surface ditches.

Included with this complex in mapping are small areas of Alazan, Kurth, and Herty soils. Alazan soils are on stream terraces and are moderately permeable. Kurth soils are better drained than Fuller soil and have a yellower subsoil. Herty soils have a thin surface layer and plastic, clay subsoil.

This Fuller soil is poorly suited to urban and recreational uses. High corrosivity to uncoated steel and concrete is a limitation. The seasonal high water table and very slow permeability are severe limitations for septic tank absorption fields, building sites, roads and streets, and recreation areas. Excess sodium is also a limiting feature for recreation areas. Proper design and

installation to partly overcome these limitations are costly.

This complex is not placed in a capability subclass or in a woodland ordination group.

HeA—Herty very fine sandy loam, 0 to 1 percent slopes. This deep soil is on nearly level, broad interstream divides that are generally the upper reaches of large drainageways. This soil occurs mainly in the Yegua, Caddell, and Manning Formations. The mapped areas are mainly concave.

This soil has a very fine sandy loam surface layer about 6 inches thick. It is dark grayish brown to a depth of 2 inches and light brownish gray from 2 to 6 inches. The subsoil is clay to a depth of 53 inches. It is dark grayish brown to a depth of 16 inches, dark gray to a depth of 41 inches and is layers of dark grayish brown and grayish brown below that. The underlying material is grayish brown shale that contains gypsum.

Herty soil is somewhat poorly drained and very slowly permeable. The available water capacity is low. Runoff is medium. Erosion is a slight hazard. The surface layer is supersaturated with a perched water table during the cool season.

Included in mapped areas are small spots of Diboll soils. Also included are spots of soils that are alkaline and some slick spots. The included soils make up about 10 percent of mapped areas.

This Herty soil is used mainly as woodland and is moderately suited to pine and hardwoods. Although this is not one of the best timber soils in the county, it produces quality timber if managed properly. Natural reproduction on these soils is generally prolific. Larger trees tend to have crooked trunks because of the high shrink-swell potential of the sticky and plastic, clayey subsoil. Planting pine seedlings is difficult because of large air spaces left around the roots in the clayey subsoil. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is moderately suited to some truck crops, but only a few acres are used as cropland.

This soil is only moderately suited to pasture and hayland grasses because of the clayey subsoil, the thin surface layer, and wetness early in spring. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass, common bermudagrass, and improved bahiagrass.

This soil is not suited to most orchard crops because of wetness and the clayey subsoil.

This soil is poorly suited to urban and recreational uses. The seasonal high water table and very slow permeability are severe limitations for septic tank absorption fields, building sites, roads and streets, and recreation areas. High corrosivity to uncoated steel and concrete, low strength affecting roads and streets, and high shrink-swell potential are other limiting features. Proper design and installation to partly overcome these limitations are costly.

This Herty soil is in capability subclass IIIw and in woodland ordination group 8C.

HeB—Herty very fine sandy loam, 1 to 5 percent slopes. This deep soil is on gently sloping, broad interstream divides in which many shallow drainageways head. The soil is mainly in the southern part of the Yegua Formation and in the Caddell and Manning Formations. The mapped areas are generally concave.

This soil typically has a dark grayish brown very fine sandy loam surface layer about 3 inches thick. The subsoil to a depth of 21 inches is clay loam. It is dark grayish brown to a depth of 11 inches, grayish brown below that, and has mottles of yellowish red. To a depth of 30 inches, the subsoil is grayish brown clay that has mottles of yellowish red in the upper part and yellowish brown in the lower part. The subsoil is pale olive clayey shale to a depth of 44 inches. The underlying material is pale olive clayey shale that contains gypsum.

Herty soils are somewhat poorly drained and very slowly permeable. The available water capacity is high. Runoff is medium to rapid. Erosion is a moderate hazard. The surface layer is supersaturated with a perched water table during the cool season.

Included in mapped areas are small spots of Moswell soils that are reddish in the upper part of the subsoil. Also included are small concave spots of Diboll soils and spots of soils that are alkaline. The included soils make up about 15 percent of mapped areas.

This Herty soil is used mainly as woodland and is moderately suited to pine and hardwoods. Although this soil is not one of the best timber soils in the county, it will produce quality timber if managed properly. Natural reproduction on these soils is generally prolific. Larger trees tend to have crooked trunks caused by the high shrink-swell potential of the sticky and plastic, clayey subsoil. Planting pine seedlings is difficult because of the clayey subsoil. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is moderately suited to some truck crops, but only a few acres are used as cropland.

This unit is moderately suited to pasture and hayland grasses because of the clayey subsoil, the thin surface layer, and wetness early in spring. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass, common bermudagrass, and improved bahiagrass. Some pastures are overseeded to legumes, such as white clover.

This soil is not suited to most orchard crops because of wetness and the clayey subsoil.

This soil is poorly suited to urban and recreational uses. The seasonal high water table and very slow

permeability are severe limitations for septic tank absorption fields, building sites, roads and streets, and recreation areas. High corrosivity to uncoated steel and concrete, low strength affecting roads and streets, and high shrink-swell potential are other limiting factors. Slope affects some recreational uses. Proper design and installation to partly overcome these limitations are costly.

This Herty soil is in capability subclass IVe and in woodland ordination group 8C.

HuB—Herty-Urban land complex, 1 to 5 percent slopes. This complex of gently sloping Herty soil and Urban land is on smooth, slightly concave uplands. It is about 50 percent Herty soil, 35 percent Urban land, and 15 percent other soils. This Herty soil and Urban land are so intricately mixed that separation is not practical at the scale used in mapping.

Typically, the surface layer of this Herty soil is dark grayish brown very fine sandy loam about 4 inches thick. The subsoil extends to a depth of 43 inches. To a depth of 9 inches, it is dark grayish brown clay loam that has mottles of yellowish red. From 9 to 28 inches, it is grayish brown clay that has mottles of yellowish red and yellowish brown. From 28 to 43 inches, the subsoil is light olive brown, massive clay. The underlying material to a depth of 60 inches is massive clayey shale. Reaction is very strongly acid in the surface layer and extremely acid in the subsoil.

This soil contains visible gypsum, barite, and other salts. Montmorillonitic clays give the soil a high shrink-swell potential. It is somewhat poorly drained and very slowly permeable.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that identification is not feasible. The Urban land areas of this complex are drained mainly through sewer systems, gutters, culverts, and surface ditches.

Included with these soils in mapping are small areas of Moswell and Fuller soils. Moswell soils are in higher, better drained areas than Herty soil and are reddish in the upper part of the subsoil. Fuller soils are on the same landscape as Herty soil but do not have as clayey a subsoil.

The Herty soil is poorly suited to urban and recreational uses. The seasonal high water table and very slow permeability are severe limitations for septic tank absorption fields, building sites, roads and streets, and recreation areas. High corrosivity to uncoated steel and concrete, low strength affecting roads and streets, and high shrink-swell potential are other limiting factors. Slope affects some recreational uses. Proper design and installation to partly overcome these limitations are costly.

This complex is not placed in a capability subclass or in a woodland ordination group.

Iu—Iuka fine sandy loam, occasionally flooded. This deep soil is on nearly level bottom lands of small streams and creeks in the northern part of the county. Some small areas of this soil are on long, low, natural levees of the Angelina and Neches Rivers. This soil is subject to occasional flooding. The mapped areas are long and narrow. Slope is less than 1 percent.

This soil is fine sandy loam to a depth of 60 inches. It is dark brown to a depth of 18 inches; mottled gray, strong brown, and yellowish red to a depth of 30 inches; mottled gray and brown to a depth of 47 inches; and below that, it is gray with strong brown and yellowish red mottles.

Iuka soil is moderately well drained and moderately permeable. It has a high available water capacity. Runoff is slow. This soil is subject to flooding, but flooding does not occur annually and is generally for a brief duration. The water table is at a depth of 1 foot to 3 feet during the cool season.

Included in mapped areas of this soil are small spots of Marietta soils that are finer than Iuka soil. These Marietta soils are in long, concave areas that make up less than 5 percent of this map unit.

Most of this soil is used as pasture and woodland. The woodland is generally mixed pines and hardwoods.

This soil is well suited to pine and hardwoods. Because this soil has an ideal texture and moisture relationship, it is one of the best woodland soils in the county. Occasional flooding and seasonal wetness cause some seedling mortality and some equipment limitations. Competition from other plants can be a problem in areas that have been cleared and site prepared. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

Although only a few acres of this soil are used as cropland, the soil is well suited to crops, such as corn, and to some truck crops.

This soil is well suited to pasture and hayland grasses. Limiting features include seasonal wetness and occasional flooding. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as white clover.

This soil is well suited to orchard crops, such as pecans, but flooding can hamper normal orchard management operations.

This soil is poorly suited to urban and most recreational uses because of the hazard of flooding and the high water table.

This Iuka soil is in capability subclass IIw and in woodland ordination group 11W.

KaB—Keithville very fine sandy loam, 0 to 3 percent slopes. This deep soil is on nearly level and gently sloping terraces and low uplands throughout the county. It is mainly in concave areas and at heads of

drainageways. The mapped areas are irregularly shaped and average less than 50 acres.

This soil typically has a very fine sandy loam surface layer about 16 inches thick. It is dark grayish brown to a depth of 6 inches and pale brown below that. The subsoil, to a depth of 20 inches, is yellowish brown silty clay loam, and to a depth of 27 inches, it is strong brown clay loam that has light gray and red mottles. To a depth of 48 inches, the subsoil is distinctly mottled red, light gray, and yellowish brown clay. From 48 to 65 inches, it is light gray clay that has red and yellowish brown mottles.

This soil is somewhat poorly drained and slowly permeable. It has a high available water capacity. Runoff is slow, and water erosion is a slight hazard. A perched water table is at a depth of 2 to 3 feet during the winter.

Included in mapped areas of this soil are Woodtell and Moswell soils on knobs and ridges. These soils have a plastic, clayey subsoil immediately below the surface layer. Also included are some Alazan soils in about the same position as that of Keithville soil but the lower part of their subsoil is not plastic and clayey. Some delineations have isolated mounds of Sawtown soils. The included soils make up less than 15 percent of the total acres of this soil.

Areas of this Keithville soil are used equally for timber and pasture.

This soil is slightly wet but is well suited to pines and hardwoods. Logging or machinery use may be restricted to dry periods. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

Although only a few acres of this soil is used as cropland, the soil is well suited to crops, such as corn, and to some truck crops.

This soil is well suited to pasture and hayland grasses mainly because of seasonal wetness. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as singletary peas.

This soil is poorly suited to most orchard crops.

This soil is poorly suited to most urban and recreational uses. The high water table and moderately slow permeability are limiting features for septic tank absorption fields. Wetness is a limitation for building sites, roads and streets, and recreation areas; and low strength is a limitation for local roads and streets. Proper design and installation to partly overcome these problems are costly.

This Keithville soil is in capability subclass IIe and in woodland ordination group 9W.

Kb—Keithville-Sawtown complex, gently undulating. These deep soils are on a mounded terrace landscape. The lows or intermounds of the Keithville soil are sinuous and generally continuous and may completely surround individual mounds of the Sawtown soil. These soils formed in old wind-modified sediment underlain by more clayey material. The mapped areas are mostly less than 200 acres.

This mounded terrace consists of about 50 percent mounds and 50 percent lows or intermounds. The mounds are about 2 to 5 feet above the lows and are 40 to 120 feet wide. The lows are generally continuous in length but are only 20 to 50 feet wide. This complex is about 45 percent Keithville soil and about 40 percent Sawtown soil.

This Keithville soil has a silt loam surface layer about 10 inches thick. It is dark grayish brown to a depth of 3 inches and below that, it is pale brown with strong brown mottles. The subsoil, to a depth of 21 inches, is strong brown silt loam that has light gray mottles. The subsoil is clay loam to a depth of 65 inches. It is mottled strong brown, yellowish red, and light gray to a depth of 34 inches; mottled yellowish red, strong brown, and light gray to a depth of 52 inches; and below that, it is light gray with strong brown and pale brown mottles. The underlying material is alternate layers of grayish brown, light brownish gray, and yellowish brown shale.

This Sawtown soil has a fine sandy loam surface layer about 17 inches thick. It is dark grayish brown to a depth of 5 inches, brown from 5 to 11 inches, and pale brown below that. The subsoil, to a depth of 35 inches, is yellowish brown loam that has pale brown mottles. To a depth of 58 inches, it is mottled yellowish red, yellowish brown, and light gray clay loam. The subsoil to a depth of 65 inches is light gray clay loam that has strong brown mottles.

Keithville soil is somewhat poorly drained, and Sawtown soil is moderately well drained. Both soils have a high available water capacity. Keithville soil is slowly permeable, and Sawtown soil is moderately slowly permeable. Runoff is slow, and erosion is a slight hazard.

Included in mapped areas are small spots of Alazan soils in some lows and small spots of Bernaldo soils on some mounds. The included soils generally make up less than 10 percent of mapped areas.

Most areas of the soils in this complex are used as pasture.

The Keithville and Sawtown soils are well suited to woodland but wetness is a slight limitation to use of Keithville soils. Both soils are well suited to the production of woodland understory plants for use by livestock and wildlife.

The soils in this complex are well suited to some crops and vegetables, but these soils are not used for crops.

These soils are well suited to pasture and hayland grasses. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses and legumes.

Keithville soil is moderately suited to some orchard crops, and Sawtown soil is well suited.

Keithville soil is poorly suited to most urban and recreational uses. The high water table and slow permeability are limiting features for septic tank filter fields. Wetness is a limitation for building sites, roads and streets, and recreational areas, and low strength is a limitation for local roads and streets. Proper design and installation to partly overcome these problems are costly. Sawtown soil is suited to urban uses and well suited to recreational uses. Wetness and moderately slow permeability are limiting features for septic tank absorption fields. The shrink-swell potential and wetness are limitations for building sites. Low strength is a limitation for local roads and streets, and moderately slow permeability is a limitation for recreation areas. These limitations can be overcome with good design and installation.

This complex is in capability subclass IIe. Keithville soil is in woodland ordination group 9W, and Sawtown soil is in woodland ordination group 9A.

KcB—Keltys fine sandy loam, 1 to 5 percent slopes. This deep soil is on broad, gently sloping, slightly convex, low ridges in nearly all upland parts of the county south of Texas Highway 103. These areas are probably old alluvial fans or natural levees deposited by ancient stream meanders. The mapped areas are oblong and average about 70 acres.

This soil has a fine sandy loam surface layer about 26 inches thick. It is dark grayish brown to a depth of 5 inches, brown stained with yellowish red from 5 to 10 inches, and pale brown with light gray mottles and yellowish red stains from 10 to 26 inches. The subsoil is strong brown fine sandy loam to a depth of 48 inches. It has tongues of light brownish gray from 26 to 42 inches and tongues of grayish brown from 42 to 48 inches. The underlying material is light yellowish brown siltstone. Cracks in the upper part of the underlying material are filled with dark grayish brown to dark gray material.

This soil is moderately well drained and slowly permeable. It has a medium available water capacity. Runoff is medium. Water erosion is a slight hazard. A perched water table is at a depth of 30 to 40 inches in winter and early in spring.

Included in some mapped areas of this soil are areas of Alazan, Diboll, Fuller, and Kurth soils. Kurth soils are on the same landscape as Keltys soil but are more clayey in the lower part of the subsoil. Diboll and Fuller soils are at slightly lower elevations and are wetter than Keltys soil. Alazan soils are slightly lower, more silty, and deeper than Keltys soil. The included soils make up about 25 percent of the mapped areas.

This Keltys soil is used mainly as pasture and woodland.

This soil is well suited to pine and hardwood. It has an excellent soil and moisture relationship and is nearly ideal for most woody plant growth. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife. Rapid growth of the overstory and plant competition can reduce production.

Although only a few acres of this soil are used as cropland, the soil is well suited to crops, such as corn, and to some truck crops.

This soil is well suited to pasture and hayland grasses (fig. 14). Seasonal wetness is a limiting feature. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass, common bermudagrass, and improved bahiagrass. Some pastures are overseeded to legumes, such as arrowleaf clover.

This soil is well suited to orchard crops, such as peaches, plums, pecans, and blackberries.

This soil is moderately suited to urban and recreational uses because of wetness, slow permeability, and corrosivity to uncoated steel and concrete. Good design and installation can overcome most of these limitations.

This Keltys soil is in capability subclass IIIe and in woodland ordination group 9A.

KcD—Keltys fine sandy loam, 5 to 15 percent slopes. This deep soil is on strongly sloping, low hills mainly south of Texas Highway 103. The mapped areas are oblong and average about 50 acres.

This soil has a fine sandy loam surface layer about 18 inches thick. It is dark grayish brown to a depth of 4 inches, brown from 4 to 10 inches, and pale brown from 10 to 18 inches. The subsoil extends to a depth of 44 inches. It is strong brown fine sandy loam that has tongues of light brownish gray. It has yellowish red mottles below a depth of 28 inches. The underlying material is light yellowish brown siltstone.

This soil is moderately well drained and slowly permeable. It has a medium available water capacity. Runoff is medium to rapid. Water erosion is a severe hazard.

Included in some mapped areas of this soil are Kurth soils that are more clayey in the lower part of the profile than Keltys soil. A few knobs or ridges of Rosenwall soils that have a red clay subsoil are also included. The included soils make up about 20 percent of the mapped areas.

This Keltys soil is used mainly as pasture and woodland.

This soil is well suited to pine and hardwood. It has an excellent soil and moisture relationship and is nearly ideal for most woody plant growth. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife. Rapid growth of the overstory can reduce production.

A few acres of this soil are used as cropland, but the soil is not suited to crops. Slope and the erosion hazard are limitations.

This soil is well suited to pasture and hayland grasses. Seasonal wetness is a limiting feature. Fertilizer, lime, and grazing management are needed for the best

Figure 14.—This well-managed pasture in an area of Keltys fine sandy loam, 1 to 5 percent slopes, surrounds a pond in an area of Fuller fine sandy loam, 1 to 4 percent slopes.

production of adapted grasses, such as coastal bermudagrass, common bermudagrass, and improved bahiagrass. Some pastures are overseeded to legumes, such as arrowleaf clover.

This soil is well suited to orchard crops, such as peaches, plums, pecans, and blackberries.

This soil is moderately suited to most urban and recreational uses. Slope, wetness, slow permeability, corrosivity to uncoated steel and concrete are the main limiting features. Good design and installation can overcome most of these limitations.

This Keltys soil is in capability subclass VIe and in woodland ordination group 9A.

KdB—Keltys-Urban land complex, 1 to 5 percent slopes. This complex of gently sloping Keltys soil and Urban land is on broad, slightly convex interstream divides. It is about 45 percent Keltys soil, 40 percent Urban land, and 15 percent other soils. The soils and Urban land are so intricately mixed that separation is not practical at the scale used in mapping.

Typically, this Keltys soil has a fine sandy loam surface layer about 18 inches thick. It is brown in the upper part and pale brown with light gray mottles in the lower part. The subsoil extends to a depth of 46 inches. It is strong brown fine sandy loam that has tongues of gray. The underlying material is siltstone. Keltys soil is moderately well drained and slowly permeable.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that identification is not feasible. Some areas have been reworked or modified by

removing the surface layer. The Urban land areas in this complex are drained mainly through sewer systems, gutters, culverts, and surface ditches.

Included with this complex in mapping are small areas of Kurth, Fuller, and Alazan soils. Kurth soils are on slightly convex interstream divides and have a slightly more clayey subsoil than Keltys soil. Fuller soils are on slightly concave uplands, and Alazan soils are on stream terraces. Both soils are somewhat poorly drained.

Keltys soil is moderately suited to urban and recreational uses because of wetness, slow permeability, and corrosivity to uncoated steel and concrete. Good design and installation can overcome most of these limitations.

This complex is not placed in a capability subclass or in a woodland ordination group.

KdD—Keltys-Urban land complex, 5 to 15 percent slopes. This complex of strongly sloping Keltys soil and Urban land is on short, convex side slopes or small hills. It is about 60 percent Keltys soil, 30 percent Urban land, and 10 percent other soils. This soil and Urban land are so intricately mixed that separation is not practical at the scale used in mapping.

Typically, this Keltys soil has a fine sandy loam surface layer about 17 inches thick. It is brown in the upper part and pale brown in the lower part. The subsoil extends to a depth of 46 inches. It is strong brown fine sandy loam and has tongues of gray. The underlying material is siltstone. Reaction is medium acid in the surface layer and very strongly acid in the subsoil. Keltys soil is moderately well drained and slowly permeable.

The Urban land part of this complex is covered by streets, homes, and other structures that obscure or alter the soils so that identification is not feasible. In some areas, the surface layer has been removed. The Urban land in this complex is drained mainly through sewer systems, gutters, culverts, and surface ditches.

Included with this complex in mapping are small areas of Kurth soils. Kurth soils are in gently sloping areas and have a slightly more clayey subsoil than Keltys soil.

This Keltys soil is moderately suited to most urban uses and well suited to recreational uses. Slope, wetness, slow permeability, and corrosivity to uncoated steel and concrete are the main limiting features. Good design and installation can overcome most of these limitations.

This complex is not placed in a capability subclass or in a woodland ordination group.

KfB—Kirvin fine sandy loam, 1 to 5 percent slopes. This deep soil is on broad hilltops in the north part of the county, primarily from Central to Redland and Moffit. It is on some of the highest points in the county and narrow ridges and round knobs are common. The mapped areas average about 40 acres.

This soil typically has a fine sandy loam surface layer about 11 inches thick. It is dark brown to a depth of 4 inches and pale brown from 4 to 11 inches. The subsoil to a depth of 35 inches is red with strong brown mottles. It is clay to a depth of 24 inches and clay loam from 24 to 35 inches. To a depth of 46 inches, the subsoil is yellowish red clay loam that has strong brown mottles. The underlying material to a depth of 65 inches is yellowish red, soft sandstone, that contains thin layers of light gray shale. It is mottled with strong brown.

This soil is well drained and moderately slowly permeable. It has medium available water capacity. Runoff is medium. Water erosion is a moderate hazard.

Included in mapped areas of this soil are areas of Kirvin soils that are gravelly fine sandy loam. These Kirvin soils are generally on higher knobs or hilltops than the Kirvin soil in this map unit. Also included are Cuthbert soils on steeper slopes and small, slightly concave areas of Sacul soils. The included soils make up 15 to 20 percent of some mapped areas.

This Kirvin soil is used mainly as woodland. In some minor areas, it is used as pasture.

This soil is moderately suited to pine production. Generally, hardwoods do not produce quality trees on this soil. Because of the high, convex position on the landscape, this soil suffers from lack of moisture during the summer. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

Although only a few acres of this soil are used as cropland, the soil is moderately suited to crops, such as corn, and to some truck crops.

This soil is moderately suited to pasture and hayland grasses. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass, common bermudagrass, and improved bahiagrass. Some pastures are overseeded to legumes, such as crimson clover, arrowleaf clover, and vetch.

This soil is well suited to orchard crops, such as peaches, plums, pears, and berries.

This soil is moderately suited to most urban and recreational uses. Moderately slow permeability is a limiting feature for septic tank absorption fields and recreation areas. Low strength as it affects local roads and streets, high corrosivity to uncoated steel and concrete, and the moderate shrink-swell potential are also limitations. Slope is a limitation for some recreational uses. These problems can be overcome, however, by good design and installation.

This Kirvin soil is in capability subclass IIIe and in woodland ordination group 8A.

KgB—Kirvin gravelly fine sandy loam, 1 to 5 percent slopes. This deep soil is on knobs and ridges that are high points on the landscape. This soil generally is in the northern part of Angelina County from Moffit to

Redland and Central. The mapped areas are mainly less than 50 acres.

This soil typically has a brown gravelly fine sandy loam surface layer about 14 inches thick. The subsoil is yellowish red. It is clay to a depth of 25 inches, clay loam from 25 to 45 inches, and sandy clay loam from 45 to 50 inches. The underlying material to a depth of 60 inches is yellowish red sandstone that has thin layers of light gray shale.

This soil has medium runoff, and water erosion is a moderate hazard. The available water capacity is medium. This soil is well drained and moderately slowly permeable.

Included in mapped areas of this soil are Cuthbert soils that are less deeply developed than Kirvin soil and are on steeper side slopes above drainageways. These Cuthbert soils make up less than 10 percent of the mapped areas.

This Kirvin soil is used mainly as woodland. In some minor areas, it is used as pasture.

This soil is moderately suited to pine production, but hardwoods are generally of inferior quality. Because of the gravelly surface layer and the ridge position on the landscape, this soil does not have enough moisture during the summer. This soil is moderately suited to the production of woodland understory plants for use by livestock and wildlife.

Although only a few acres of this soil are used as cropland, the soil is moderately suited to crops, such as corn, and to some truck crops.

This soil is moderately suited to pasture and hayland grasses because of the droughty, gravelly surface layer. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass. Some pastures are overseeded to legumes, such as arrowleaf clover.

This soil is moderately suited to orchard crops, such as peaches, plums, pecans, and grapes, because of the gravelly surface layer.

This soil is moderately suited to most urban and recreational uses. Moderately slow permeability is a limiting feature for septic tank absorption fields and recreation areas. Low strength as it affects local roads and streets, high corrosivity to uncoated steel and concrete, and the moderate shrink-swell potential are also limitations. Slope and small stones are limitations for some recreational uses. These problems can be overcome, however, by good design and installation. Areas of this soil can be surface mined for the gravel.

This Kirvin soil is in capability subclass IVe and in woodland ordination group 6F.

KhB—Kirvin soils, graded, 2 to 5 percent slopes. These deep soils consists of areas of Kirvin gravelly fine sandy loam that have had all or most of the surface layer removed for gravel. They are mainly in convex areas on uplands. These soils have piles of gravel, bare clay spots, and different thicknesses of a gravelly clay loam surface layer. Many areas are eroded and have gullies.

These soils typically have a brown gravelly clay loam surface layer about 3 inches thick. The subsoil extends to a depth of 47 inches. It is red clay to a depth of about 35 inches, and below that, it is red clay loam that has spots of gray, partly weathered shale. The underlying material to a depth of 60 inches is alternate layers of gray shale and strong brown sandstone.

These Kirvin soils are well drained and moderately slowly permeable. The available water capacity is medium, and runoff is rapid. Water erosion is a severe hazard.

Included in mapped areas are small areas of Cuthbert gravelly fine sandy loam from which the surface has been removed. The included soils make up about 10 percent of some mapped areas.

The Kirvin soils are used mostly as woodland and are moderately suited to pines. Since the gravelly surface layer has been removed for road material, these soils have a clayey subsoil at or near the surface. This makes it difficult for young seedlings to start growth and also causes a severe hazard of erosion. As trees grow larger, windthrow is a factor on these soils because of the shallow rooting depth. These soils are well suited to the production of woodland understory plants for use by livestock and wildlife.

These soils are poorly suited to crops and are not used as cropland.

The Kirvin soils are moderately suited to pasture and hayland grasses because of the clayey subsoil near the surface and droughtiness. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass. Some pastures are overseeded to legumes, such as arrowleaf clover.

These soils are not suited to most orchard crops because the surface layer has been removed.

These soils are poorly suited to most urban and recreational uses. Moderately slow permeability is a limiting feature for septic tank absorption fields. Low strength for roads and streets, high corrosivity to uncoated steel and concrete, and moderate shrink-swell potential for building sites are also limitations. The clayey texture near the surface is a limitation for building sites and recreation areas. Good design and installation can partly overcome most of these problems.

These Kirvin soils are in capability subclass VIe and in woodland ordination group 6C.

KmD—Kisatchie fine sandy loam, 5 to 15 percent slopes. This moderately deep soil is on strongly sloping side slopes only in the extreme southern part of Angelina County along the Jasper County line. Rocks are on the surface. The mapped areas are generally long and narrow and generally are about 70 acres.

This soil has a fine sandy loam surface layer about 6 inches thick. It is very dark grayish brown to a depth of 4 inches and brown from 4 to 6 inches. The subsoil, to a depth of 24 inches, is grayish brown silty clay that has olive brown mottles. To a depth of 36 inches, it is light brownish gray clay that has olive mottles. The underlying material to a depth of 40 inches is tuffaceous siltstone that is cracked in the upper part.

This soil has a low available water capacity. It is well drained and very slowly permeable. Runoff is rapid to very rapid, and erosion is a very severe hazard. Some areas of this soil have large gullies.

Included in mapped areas of this soil are spots of Rayburn soils that have a red subsoil. Also included are small spots of Browndell and Corrigan soils. Browndell soils are not as deep as Kisatchie soil and are generally stony. Corrigan soils are less sloping than Kisatchie soil. Also included are areas of soils that have a stony surface layer. The included soils make up about 15 percent of some mapped areas.

This Kisatchie soil is used entirely as woodland. Most areas have burned frequently in the past and have little understory. These areas have a dense stand of grass and a thin stand of longleaf pine.

This soil is moderately suited to the production of pine, particularly longleaf pine. In most areas of Kisatchie soil, longleaf pine dominate the woodland species. This may be because of regular fire, but longleaf pine seem particularly well suited to this soil. Measurements of tree growth show that longleaf and loblolly grow at about the same rate on this soil. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is not suited to crops, and it is not used as cropland. The hazard of erosion is the main limitation.

This soil is poorly suited to pasture and hayland grasses because of steepness of slope and the sticky, clayey subsoil. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as common bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as ball clover and arrowleaf clover.

This soil is not suited to most orchard crops because of the low available water capacity, steepness of slope, and the hazard of erosion.

This soil is poorly suited to most urban and recreational uses because of depth to bedrock, very slow permeability, and slope. High shrink-swell potential, high corrosivity to uncoated steel and concrete, and erodibility are other limiting features. Proper design and installation to partly overcome some of these limitations are needed.

This Kisatchie soil is in capability subclass VIe and in woodland ordination group 8C.

Ko—Koury loam, occasionally flooded. This deep soil is on nearly level bottom lands of small streams and creeks. The mapped areas are generally long and narrow and can be more than 300 acres. Slope is less than 1 percent.

Typically, this soil has a pale brown surface layer about 17 inches thick. It is loam to a depth of 3 inches, very fine sandy loam from 3 to 10 inches, and loam from 10 to 17 inches. The subsoil to a depth of 28 inches is pale brown silt loam and has light brownish gray and yellowish brown mottles. To a depth of 50 inches, the subsoil is light brownish gray silt loam with yellowish brown mottles. The underlying material to a depth of 70 inches is dark grayish brown silt loam and has mottles of yellowish brown.

This Koury soil is moderately well drained and moderately slowly permeable. It has a high available water capacity. Runoff is slow. This soil is subject to flooding, but flooding does not occur annually. Floods generally are of brief duration. The water table is at a depth of 1.5 to 2.5 feet during the cool season.

Included in mapped areas of this soil are small spots of Iuka soils, Phophers soils in the lower areas, and some areas where the Koury soil has slick spots. Iuka soils have more sand and less silt than Koury soil. Pophers soils are more poorly drained than Koury soil and are more gray. The included soils make up about 15 percent of some mapped areas.

Most areas of this Koury soil are used as woodland, mainly mixed hardwoods and pines. Minor areas are used as pasture.

This soil is well suited to pine and hardwoods and is one of the best woodland soils in the county. The texture and moisture relationship are ideal. Occasional flooding and seasonal wetness cause some seedling mortality and some equipment use limitations. Competition from other plants can cause problems in areas that are cleared and site prepared. Loblolly and slash pines are the preferred species on this soil; however, water oak, white oak, red oak, ash, and several other hardwoods grow well. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

Although only a few acres of this soil are used as cropland, the soil is well suited to crops, such as corn, and to some truck crops.

This soil is well suited to pasture and hayland grasses. Limiting features include seasonal wetness and occasional flooding. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as white clover.

This soil is well suited to orchard crops, such as pecans. Short duration flooding can hamper normal orchard management operations.

This soil is poorly suited to urban and recreational uses because of wetness and flooding.

This Koury soil is in capability subclass IIw and in woodland ordination group 11W.

Kp—Koury loam, frequently flooded. This deep soil is on nearly level bottom lands along small streams and creeks, mainly south of Lufkin. The mapped areas are long and narrow and are generally more than 300 acres. The slope is less than 1 percent.

This soil is loam to a depth of 24 inches. It is brown to a depth of 5 inches, dark grayish brown to a depth of 18 inches, and brown with light gray mottles below that. To a depth of 74 inches, this soil is silt loam. It is brown with light gray mottles to a depth of 38 inches; very dark grayish brown with light gray mottles to a depth of 45 inches, and mottled light gray and brown below that.

Koury soil is moderately well drained and moderately slowly permeable. It has a high available water capacity. Runoff is slow. This soil is subject to flooding. Flooding for a brief duration generally occurs annually. The water table is at a depth of 1.5 to 2.5 feet during the cool season.

Included in mapping are small spots of Marietta soils, Pophers soils in lower areas, and some areas where the Koury soil has slick spots. Marietta soils have less silt than Koury soil. Pophers soils are more poorly drained and are more gray. The included soils make up about 15 percent of some mapped areas.

Most of this Koury soil is used as woodland, mainly mixed pines and hardwoods.

This soil is well suited to pine and hardwoods and is one of the best woodland soils in the county. The texture and moisture relationship is ideal. Frequent flooding and seasonal wetness cause some seedling mortality and some equipment use limitations. Competition from other plants can cause problems in areas that are cleared and site prepared. Loblolly and slash pines are the preferred species on this soil; however, water oak, white oak, red oak, ash, and several other hardwoods grow well. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is poorly suited to crops because of frequent flooding.

This soil is well suited to pasture and hayland grasses. Limiting features include seasonal wetness and frequently flooding. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as white clover.

This soil is well suited to orchard crops, such as pecans. Short duration flooding can hamper normal orchard management operations.

This soil is not suited to urban and recreational uses because of wetness and frequent flooding.

This Koury soil is in capability subclass Vw and in woodland ordination group 11W.

Ks—Koury-Urban land complex, occasionally flooded. This complex is made up of nearly level Koury soil and Urban land on flood plains. It is about 45 percent Koury soil, 35 percent Urban land, and 15 percent other soils. This Koury soil and Urban land are so intricately mixed that separation is not practical at the scale used in mapping. Slopes are generally less than 1 percent except in excavated or fill areas.

Typically, Koury soil is loam to a depth of 14 inches. It is dark brown in the upper part and brown in the lower part. The next layer to a depth of 32 inches is brown silt loam that has light brownish gray mottles. To a depth of 48 inches, the soil is grayish brown silt loam, and below that it is massive silt loam. Koury soil is moderately well drained and moderately slowly permeable.

The Urban land part of this complex is covered by streets, parking lots, a few homes, and some apartments that obscure or alter the soils so that identification is not feasible. Some areas have had channel improvement. The Urban land is drained mainly through sewer systems, gutters, culverts, and surface ditches.

Included with this complex in mapping are small areas of Pophers soils that are more gray than Koury soil and also are more clayey and wet.

Koury soil is poorly suited to urban and recreational uses because of wetness and flooding.

This complex is not placed in a capability subclass or in a woodland ordination group.

KuB—Kurth fine sandy loam, 0 to 4 percent slopes. This deep soil is on broad, nearly level to gently sloping, slightly convex, long, low ridges. It is in nearly all upland parts of the county. Areas of this soil are on old, natural levees deposited by ancient streams. The mapped areas average about 60 acres and are generally long and oblong.

This soil has a fine sandy loam surface layer about 27 inches thick that is dark brown to a depth of 4 inches, brown to a depth of 11 inches, and pale brown below that. The subsoil to a depth of 33 inches is yellowish brown fine sandy loam, and to a depth of 46 inches it is mottled strong brown and red sandy clay loam. Tongues of light brownish gray are in these layers of the subsoil. To a depth of 56 inches, the subsoil is light brownish gray sandy clay loam that has red and yellowish brown mottles and tongues of light brownish gray. The underlying material is light brownish gray sandstone that has stains of yellowish brown.

This soil is moderately well drained and slowly permeable. It has a medium available water capacity. Runoff is medium. Water erosion is a moderate hazard. A perched water table is at a depth of 30 to 40 inches in winter and early in spring.

Included in some mapped areas of this soil are Keltys and Rosenwall soils and a few areas where the Kurth soil has a loamy fine sand surface layer 20 to 40 inches thick. Keltys soils have less clay in the subsoil than

Kurth soil. Rosenwall soils are on knobs or ridges. They have a red clay subsoil. The included soils make up about 20 percent of the mapped areas.

This Kurth soil is used mainly as pasture and woodland.

This soil is well suited to pine and hardwood. It has an excellent soil and moisture relationship and is nearly ideal for most woody plant growth. Mechanical and hand planting work well on this soil. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife. Rapid growth of the overstory can reduce production.

Although only a few acres of this soil are used as cropland, the soil is well suited to crops, such as corn, and to some truck crops.

This soil is well suited to pasture and hayland grasses. Seasonal wetness is a limitation. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass, common bermudagrass, and improved bahiagrass. Some pastures are overseeded to legumes, such as arrowleaf clover.

This soil is well suited to orchard crops, such as peaches, plums, pecans, and blackberries.

This soil is moderately suited to urban and recreational uses. Slow permeability is a limitation for septic tank absorption fields and recreation areas. Wetness, corrosivity to uncoated steel, and low strength affecting roads and streets are other limiting features. Good design and installation can partly overcome these problems.

This Kurth soil is in capability subclass IIIe and in woodland ordination group 9A.

KwB—Kurth-Urban land complex, 0 to 4 percent slopes. This complex of nearly level to gently sloping Kurth soil and Urban land is on broad interstream divides. It is about 50 percent Kurth soil, 35 percent Urban land, and 15 percent other soils. This Kurth soil and Urban land are so intricately mixed that separation is not practical at the scale used in mapping.

Typically, Kurth soil has a fine sandy loam surface layer about 28 inches thick. It is brown in the upper part and pale brown with yellowish brown and light brownish gray mottles in the lower part. The subsoil is mottled light brownish gray, strong brown, and red sandy clay loam to a depth of 54 inches. The underlying material is sandstone. Kurth soil is moderately well drained and slowly permeable.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that identification is not feasible. These areas are drained mainly through sewer systems, gutters, culverts, and surface ditches.

Included with this complex in mapping are small areas of Fuller, Alazan, and Keltys soils. Fuller soils are on slightly concave uplands and Alazan soils are on stream terraces. Both soils are somewhat poorly drained. Keltys soils are on slightly convex interstream divides and have less clay in the subsoil than Kurth soil.

Kurth soil is moderately suited to urban and recreational uses. Slow permeability is a limitation for septic tank absorption fields and recreation areas. Wetness, corrosivity to uncoated steel, and low strength affecting roads and streets are other limiting features. Good design and installation can partly overcome these problems.

This complex is not placed in a capability subclass or in a woodland ordination group.

LaB—Lacerda clay loam, 0 to 4 percent slopes. This deep soil is in nearly level and gently sloping areas. The surface is covered with small humps or gilgai that are about 4 inches higher than the microlows. During wet weather, small pockets of water stand on the surface.

This soil typically has a dark grayish brown clay loam surface layer about 2 inches thick. The next layer is mottled red, strong brown, and light gray silty clay to a depth of 7 inches. The soil is sticky and plastic clay to a depth of 42 inches. It is mottled red and light gray from 15 to 21 inches, and below that, it is light brownish gray with red mottles. The underlying material is light yellowish brown and light brownish gray clay with layered shale that contains gypsum.

This soil is very slowly permeable and somewhat poorly drained. It has a high available water capacity. Runoff is medium. Water erosion is a moderate hazard. A perched water table is within 2 feet of the surface during winter and spring.

Included in mapped areas of this soil are small areas of Woodtell and Etoile soils. These soils have a loamy surface layer. Etoile soils are calcareous in the lower part of the profile. The included soils make up less than 15 percent of the mapped areas.

This Lacerda soil is used almost entirely as woodland and is moderately suited to pine and hardwoods. Although this is not one of the better timber soils in the county, it will produce quality timber if managed properly. Natural reproduction on this soil is generally prolific. Because of the high shrink-swell potential, larger trees tend to have crooked trunks. Planting pine seedlings is difficult because of the clayey subsoil. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

Although only a few acres of this soil are used as cropland, the soil is moderately suited to crops, such as corn, and to some truck crops.

This soil is only moderately suited to pasture and hayland grasses because of the clayey subsoil, the thin surface layer, and wetness early in spring. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass, common bermudagrass, and improved

bahiagrass. Some pastures are overseeded to legumes, such as vetch and singletary peas.

This soil is not suited to most orchard crops because of the heavy clay subsoil.

This soil is poorly suited to urban and recreational uses. The seasonal high water table and very slow permeability are limitations for septic tank absorption fields and recreation areas. High shrink-swell potential, corrosivity to uncoated steel, and low strength as it affects local roads and streets are other limitations. Proper design and installation to partly overcome these problems are costly.

This Lacerda soil is in capability subclass IIIe and in woodland ordination group 8C.

LeC—Letney loamy sand, 1 to 8 percent slopes. This deep soil is on broad interstream divides on the highest elevation in the southern part of the county along the Jasper County line. This soil is droughty. Slopes are mainly 2 to 4 percent. The mapped areas are irregular in shape and vary in size, but average more than 40 acres.

This soil has a loamy sand surface layer about 35 inches thick. It is dark grayish brown to a depth of 5 inches, brown from 5 to 9 inches, and pale brown from 9 to 35 inches. The subsoil to a depth of 80 inches is yellowish brown sandy clay loam. It has yellowish red mottles from 35 to 61 inches and red and light brownish gray mottles from 61 to 80 inches.

This soil is well drained and moderately rapidly permeable. It has a low available water capacity. Runoff is slow. Water erosion is a slight hazard.

Included in mapped areas are mostly smooth areas of Tehran soils that have a surface layer thicker than 40 inches. Tehran soils make up about 20 percent of the map unit.

This Letney soil is used almost entirely as woodland and is well suited to pine trees. Hardwoods on this soil are generally inferior in quality. Seedling mortality is moderate; however, once trees are established, they do well on these soils. Longleaf, loblolly, and shortleaf pines are on these soils, but under natural conditions, most of the area is covered with longleaf pine. This soil is moderately suited to the production of woodland understory plants for use by livestock and wildlife. Lack of moisture in the thick, sandy surface layer reduces production.

This soil is not used as cropland, but it is moderately suited to crops, such as corn, and to some truck crops. This soil is well suited to watermelons.

This soil is moderately suited to pasture and hayland grasses because of the droughty, sandy surface layer. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass. Some pastures are overseeded to legumes, such as vetch.

This soil is moderately suited to orchard crops, such as peaches, plums, pears, grapes, and berries. The low available water capacity and droughtiness are restrictions.

This soil is moderately suited to urban and recreational uses. The main limitations are high corrosivity to concrete and caving of cutbanks in excavations. The sandy surface layer and steepness of slope are limitations for some recreational uses.

This Letney soil is in capability subclass IIIs and in woodland ordination group 9S.

LtB—Lilbert loamy fine sand, 1 to 5 percent slopes. This deep soil is on gently sloping, broad interstream divides. The mapped areas are irregular in shape and vary in size, but average less than 40 acres.

This soil has a loamy fine sand surface layer about 31 inches thick. It is dark grayish brown to a depth of 7 inches, brown from 7 to 12 inches, and pale brown from 12 to 31 inches. The subsoil to a depth of 65 inches is strong brown sandy clay loam that has red mottles from 39 to 54 inches and with red and light gray mottles from 54 to 65 inches.

This soil is well drained and moderately slowly permeable. It has a medium available water capacity. Runoff is slow. Water erosion is a slight hazard.

Included in mapped areas are small areas of Keltys and Darco soils. Keltys soils have a fine sandy loam surface layer, and Darco soils have a sandy surface layer thicker than 40 inches. The included soils make up less than 20 percent of the mapped areas.

This Lilbert soil is used mainly as woodland and pasture.

This soil is well suited to pine trees, but hardwoods are generally inferior in quality. Seedling mortality is moderate; however, once trees are established, they do well on this soil. Longleaf, loblolly, and shortleaf pines are on these soils. This soil is moderately suited to the production of woodland understory plants for use by livestock and wildlife. Lack of moisture in the thick sandy surface layer reduces production.

This soil is not used as cropland, but it is moderately suited to crops, such as corn, and to some truck crops. This soil is well suited to watermelons.

This soil is well suited to pasture and hayland grasses, but the droughty, sandy surface layer is a limiting feature. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass. Some pastures are overseeded to legumes, such as vetch.

This soil is moderately suited to orchard crops, such as peaches, plums, pears, grapes, and berries. Droughtiness is a limitation.

This soil is well suited to most urban and recreational uses. The moderately slow permeability is a limiting feature for septic tank absorption fields, and corrosivity is a limiting feature for concrete. Caving of cutbanks is a

hazard in excavation. The sandy surface texture is a limiting feature for recreational areas. These problems can be overcome with good design and installation.

This Lilbert soil is in capability subclass IIIs and in woodland ordination group 9S.

Ma—Mantachie clay loam, frequently flooded. This deep soil is on bottom land in a broad, uniform area on the Angelina River flood plain. This soil extends from Cherokee County to the southeast where it is covered by Sam Rayburn Reservoir. Old stream channels occur without pattern and at irregular intervals. Slopes are less than 1 percent.

This soil has a grayish brown clay loam surface layer about 5 inches thick. This subsoil is clay loam to a depth of 40 inches. It is mottled light brownish gray and yellowish red to a depth of 10 inches, light gray with strong brown mottles to a depth of 30 inches, and mottled grayish brown and light gray below that. The underlying material is gray clay.

Mantachie soil is somewhat poorly drained and moderately permeable. It has a high available water capacity. Runoff is slow. This soil overflows two to three times per year in most years. Flooding lasts from 2 days to 4 weeks. The water table is at or near the surface during the cool season.

Included in the mapped area of this soil are Marietta soils that are higher than Mantachie soil and are better drained. Also included are some soils in sloughs and on some natural levees near the river channel. These soils are sandier than Mantachie soil. The included soils make up about 10 percent of the mapped area.

This Mantachie soil is used almost entirely as woodland and is well suited to water oak, willow oak, white oak, and swamp chestnut oak. Pines are on the better drained and sandier soils that are included in this map unit, such as those on the natural levees deposited next to the stream channel. Frequent flooding and extended wetness are problems on this soil. Logging operations are limited to summer and fall. Pine seedlings should not be planted under natural conditions. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is not suited to use for crops, and it is not used as cropland. Wetness and the hazard of frequent flooding are limitations.

This soil is poorly suited to pasture and hayland grasses because of wetness and frequent flooding. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as improved bahiagrass. Some pastures are overseeded to legumes, such as white clover.

This soil is not suited to most orchard crops because of wetness and flooding.

This soil is not suited to urban and recreational uses because of wetness and frequent flooding (fig 15)

This Mantachie soil is in capability subclass Vw and in woodland ordination group 8W.

Me—Marietta fine sandy loam, occasionally flooded. This deep soil is on high bottom lands mainly in the Angelina River area. It formed in loamy alluvial sediment. Areas of this soil are normally adjacent to the steeper uplands and are generally 1 foot to 3 feet above the normal flood plain. They are in alluvial fans and outwash areas of smaller streams that are entering the major flood plain. Slope is less than 1 percent.

This soil has a fine sandy loam surface layer about 9 inches thick that is dark brown to a depth of 5 inches and brown below that. The subsoil is brown clay loam that has light gray mottles to a depth of 17 inches. From 17 to 35 inches, it is mottled light gray, brown, and yellowish red sandy clay loam. The next layer to a depth of 60 inches is light gray clay loam that has strong brown mottles.

This soil is moderately well drained and moderately permeable. The available water capacity is high. Runoff is slow. This soil floods only 2 to 4 times in 10 years, and flooding is for brief durations.

Included in mapped areas of this soil are luka and Mantachie soils. luka soils are on higher natural levees than Marietta soil and contain more sand. Mantachie soils are in lower areas, and are wetter and more clayey. The included soils make up about 15 percent of the mapped areas.

This Marietta soil is used mainly as pasture.

This soil is well suited to pine and hardwoods and is one of the best woodland soils in the county. The texture and moisture relationship is ideal. Occasional flooding and seasonal wetness cause some seedling mortality and some equipment use limitations. Competition from other plants can cause problems in areas that are cleared and site prepared. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

Although only a few acres of this soil are used as cropland, the soil is well suited to crops, such as corn, and to some truck crops.

This soil is well suited to pasture and hayland grasses. Limiting features include seasonal wetness and occasional flooding. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as white clover.

This soil is well suited to orchard crops, such as pecans. Short duration flooding can hamper normal orchard management operations.

This soil is poorly suited to urban and recreational uses because of the high water table and flooding.

This Marietta soil is in capability subclass IIw and in woodland ordination group 11W.

Figure 15.—Frequent flooding in this area of Mantachie clay loam, freqently flooded, prohibits the year-round use of recreation facilities, for example, picnic areas.

Mf—Marietta fine sandy loam, frequently flooded. This deep soil is on stream bottom lands mainly in the northern part of the county. It formed from loamy alluvial sediment. The mapped areas are long and narrow and normally more than 500 acres. Slope is less than 1 percent.

This soil has a fine sandy loam surface layer about 10 inches thick that is brown to a depth of 5 inches and dark brown with dark grayish brown mottles below that. To a depth of 20 inches, the subsoil is mottled dark brown and light brownish gray loam, and to a depth of 30 inches, it is mottled light brownish gray and dark brown sandy clay loam. The subsoil to a depth of 60 inches is mottled light brownish gray, light gray, and strong brown sandy clay loam.

This soil is moderately well drained and moderately permeable. The available water capacity is high. Runoff is slow. This soil floods at least once every 2 years. Flooding is for brief durations.

Included in mapped areas are luka and Mantachie soils and a soil that is strongly acid somewhere in the profile but is otherwise similar to Marietta soil. luka soils are on fine sandy ridges and are fine sandy loam. Mantachie soils are grayish and they are in lower concave areas than Marietta soil and are wetter. The included soils make up from 20 to 25 percent of some mapped areas.

This Marietta soil is used as pasture and woodland.

This soil is well suited to pine and hardwoods and is one of the best woodland soils in the county. The texture and moisture relationship is ideal. Frequent flooding and seasonal wetness cause some seedling mortality and some equipment use limitations. Competition from other plants can cause problems in areas that are cleared and site prepared. Established woodlands on this soil can produce 600 or more board feet per acre each year. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

Although only a few acres of this soil are used as cropland, the soil is poorly suited to crops, such as corn, and to some truck crops. The hazard of flooding is the main limitation.

This soil is well suited to pasture and hayland grasses. Limiting features include seasonal wetness and occasional flooding. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as white clover.

This soil is well suited to orchard crops, such as pecans. Short duration flooding can hamper normal orchard management operations.

This soil is not suited to urban and recreational uses because of wetness and frequent flooding.

This Marietta soil is in capability subclass Vw and in woodland ordination group 11W.

MhB—Melhomes loamy sand, frequently flooded. This deep, extremely wet, sandy soil is in nearly level to gently sloping, concave areas in the extreme southern part of Angelina County. It formed in sandy sediment. Springs are in some areas of this soil, and the soil parallels the spring flow channels. The mapped areas are less than 40 acres.

Typically, Melhomes soil has a 2-inch covering of decomposed forest litter over the soil surface. The soil is loamy sand throughout. It is dark gray and very dark gray to a depth of 5 inches, mottled dark gray and dark grayish brown to a depth of 9 inches, and light gray to a depth of 65 inches.

This soil is poorly drained and rapidly permeable. It is seldom dry below a depth of 6 to 10 inches. During the cool season, shallow water stands on or moves over the surface. Many continuous-flowing springs issue from this soil. Water erosion is a slight hazard.

This soil is used as woodland. Some delineations have spots so wet that only marsh grasses and bay trees can survive.

This soil is generally suited to poorly suited to pine and hardwoods. It is extremely wet, and water oozes or seeps from the surface during most of each year. Because of this, the soil will not support machinery, and logging or planting new seedlings is difficult. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife. Extreme wetness in some spots reduces production.

This soil is not suited to crops, and it is not used as cropland. The extreme wetness is the main limitation.

This soil is poorly suited to pasture and hayland grasses because of the extreme wetness. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as improved bahiagrass.

This soil is not suited to most orchard crops because of wetness.

This soil is not suited to urban and recreational uses. The hazard of occasional flooding and the year-round high water table at or near the surface of the soil are limitations.

This Melhomes soil is in capability subclass VIw and in woodland ordination group 7W.

MoA—Mollville loam, 0 to 1 percent slopes. This deep soil is in concave areas on moundy terrace landscapes mainly near the Neches and Angelina Rivers. Most of this soil is in long, narrow, sinuous lows, but some areas are in rounded depressions. The mapped areas are mainly less than 20 acres.

This soil has a loam surface layer about 12 inches thick that is dark grayish brown to a depth of 2 inches and light brownish gray stained with strong brown below that. The subsoil is clay loam to a depth of 51 inches. To a depth of 21 inches, it is grayish brown with tongues of light brownish gray. From 21 to 30 inches, the subsoil is grayish brown with strong brown mottles and is penetrated by tongues of light gray. It is grayish brown with strong brown and dark grayish brown mottles to a depth of 51 inches. The underlying material is light brownish gray sandy clay loam.

This soil is poorly drained and slowly permeable. It has a high available water capacity. Runoff is very slow. Water erosion is a slight hazard. This soil is supersaturated with a perched water table and, at times, is covered with water during the cool season.

Included in some mapped areas of this soil are small spots of Alazan soils that are less gray and more yellowish brown in the upper part of the profile than Mollville soil. These Alazan soils make up less than 5 percent of the map unit.

This Mollville soil is used almost entirely as woodland and is moderately suited to hardwoods. Because of wetness and cool season ponding, this soil is not suited to pines. The pines that are on this soil are on small moundy areas of the included soils. This soil is moderately suited to the production of woodland understory plants for use by livestock and wildlife. Wetness and surface ponding reduce production.

This soil is poorly suited to crops, and it is not used as cropland.

This soil is poorly suited to pasture and hayland grasses because of wetness and surface ponding. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as improved bahiagrass. Some pastures are overseeded to legumes, such as white clover.

This soil is not suited to most orchard crops because of wetness.

This soil is poorly suited to urban and recreational uses mainly because of ponding. Other limiting features are high corrosivity to uncoated steel and concrete and caving of cutbanks in excavation. Proper design and installation to overcome these limitations are costly.

This Mollville soil is in capability subclass IVw and in woodland ordination group 6W.

Mp—Mollville-Besner complex, gently undulating. This complex consists of Mollville soil in lows and Besner soil on mounds. These soils are on nearly level, moundy stream terraces near most major streams throughout the county but mainly along the Angelina and Neches Rivers. The mapped areas average about 130 acres. They are on alternate lows and mounds.

The complex is about 45 percent Mollville soil, 35 percent Besner soil, and 20 percent other soils. The lows make up 40 to 70 percent of the mapped areas. They are sinuous and vary greatly in length, but are mostly 30 to 130 feet wide. The mounds are generally rounded and are 1.5 to 5.0 feet in height and 40 to 300 feet wide. They make up 30 to 50 percent of the mapped areas.

Mollville soil has a loam surface layer about 10 inches thick that is dark gray to a depth of 5 inches and light brownish gray below that. The subsoil is clay loam to a depth of 55 inches. To a depth of 20 inches, it is grayish brown penetrated by tongues of light gray loam. To a depth of 20 to 43 inches, it is gray, penetrated by tongues of light gray loam. Below that, it is light brownish gray and grayish brown. The subsoil has mottles of strong brown throughout. The underlying material is light gray sandy clay loam.

Besner soil has a fine sandy loam surface layer about 32 inches thick that is dark grayish brown to a depth of 3 inches, brown from 3 to 8 inches, and pale brown below that. The subsoil to a depth of 53 inches is strong brown loam that has pale brown mottles from 43 to 53 inches. The next layer to a depth of 60 inches is mottled strong brown and light gray loam that has stripped areas of light gray.

Mollville soil is poorly drained and slowly permeable. Besner soil is well drained and moderately permeable. Runoff is slow. Both soils have a high available water capacity. Mollville soil is saturated during most of the cool season. Some areas are covered with water for long periods.

Included in mapped areas of these soils are Bernaldo and Alazan soils. Bernaldo soils are on the lower fourth of the mounds and make up from 5 to 15 percent of the mounds. Their surface layer is less than 20 inches thick. Alazan soils are in the lows and are better drained than Mollville soil. The included soils make up less than 20 percent of the map unit.

The soils in this map unit are used mainly as woodland and grow two distinct types of vegetation. Water-loving hardwood trees are on Mollville soil, and pines are on Besner soil. These soils are also used as pasture, mainly improved grasses on Besner soil and water-loving plants on Mollville soil.

Mollville soil is moderately suited to hardwoods, and Besner soil is well suited to pines. Limiting features on Mollville soils include extreme wetness and standing water late in winter and early in spring. Except for being surrounded by areas of the wet Mollville soil, Besner soil has few limitations for woodland production. Mollville soil is moderately suited to the production of woodland understory plants for use by livestock and wildlife, and Besner soil is well suited.

The soils in this map unit are poorly suited to most crops and vegetables, and they are not used for crops.

Mollville soil is poorly suited to pasture and hayland grasses, and Besner soil is well suited. Fertilizer, lime, and grazing management are necessary for the best production of adapted grasses and legumes.

Mollville soil is not suited to most orchard crops because of wetness. Besner soil is well suited to peaches, plums, grapes, and berries.

Mollville soil is poorly suited to urban and recreational uses because of ponding. Besner soil is well suited to most urban and recreational uses. Wetness, low strength affecting roads and streets, and corrosivity to uncoated steel and concrete are the main limitations. Caving of cutbanks is a hazard in excavation. Proper design and installation to overcome most of these problems can be costly.

This complex is in capability subclass IVw. Mollville soil is in woodland ordination group 6W, and Besner soil is in woodland ordination group 9A.

MsB—Moswell loam, 1 to 5 percent slopes. This deep soil is on slightly concave to smooth, gently sloping, broad interstream divides. It developed in marine shales and clays. In some areas, the surface has small humps or gilgai about 2 to 3 inches high. The mapped areas average about 100 acres.

Typically, Moswell soil has a loam surface layer about 5 inches thick that is dark grayish brown to a depth of 2 inches and pale brown below that. The subsoil is sticky and plastic clay to a depth of 37 inches and platy clay to a depth of 45 inches. It is red and has grayish brown mottles from 5 to 12 inches; mottled grayish brown and yellowish red from 12 to 23 inches; mottled grayish brown, yellowish red, and yellowish brown from 23 to 31 inches; and mottled grayish brown and light brownish gray from 31 to 37 inches. From 37 to 45 inches, the subsoil is mottled grayish brown, light brownish gray, and yellowish brown. The underlying material to a depth of about 70 inches is olive to pale yellow shale. The soil contains gypsum and other salts below a depth of 23 inches.

This soil is very slowly permeable and moderately well drained. It has a medium available water capacity. Water erosion is a severe hazard.

Included in mapped areas of this soil are some clayey Raylake soils and some Moswell soil that has slope of more than 5 percent. The included soils make up less than 10 percent of the mapped areas.

This Moswell soil is used mainly as woodland and is moderately suited to pines. Hardwoods generally are of poor quality. Although this is not one of the better timber soils in the county, it produces quality timber if managed properly. Natural reproduction on these soils is generally prolific. Larger trees tend to have crooked trunks because of the high shrink-swell potential. Planting pine seedlings is difficult because of the clayey subsoil. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is poorly suited to crops, such as corn, and to some truck crops, and only a few acres are used as cropland.

This soil is moderately suited to pasture and hayland grasses because of the clayey subsoil, the thin surface layer, and wetness early in spring. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass, common bermudagrass, and improved bahiagrass. Some pastures are overseeded to legumes, such as singletary peas.

This soil is not suited to most orchard crops because of the clayey subsoil.

This soil is poorly suited to urban and recreational uses. Very slow permeability is a limitation for septic tank absorption fields and recreation areas. Other limiting features are high shrink-swell potential, high corrosivity to uncoated steel and concrete, and low strength affecting roads and streets. Proper design and installation to partly overcome these limitations are costly.

This Moswell soil is in capability subclass IVe and in woodland ordination group 8C.

MsD—Moswell loam, 5 to 15 percent slopes. This deep soil is on strongly sloping side slopes above drainageways. It developed in clayey marine deposits. The mapped areas are mostly long and narrow and average less than 70 acres.

This soil typically has a loam surface layer about 5 inches thick that is dark grayish brown to a depth of 3 inches and pale brown below that. The subsoil is clay to a depth of 50 inches. To a depth of 21 inches, it is red with light brownish gray mottles from 9 to 21 inches. To a depth of about 37 inches, the subsoil is mottled light gray and red, and it is gray with yellowish red mottles below that. The underlying material to a depth of at least 60 inches is olive shale.

This soil is very slowly permeable and moderately well drained. It has a medium available water capacity. Water erosion is a very severe hazard.

Included in mapped areas of this soil are Rosenwall and Raylake soils. Rosenwall soils are not as deep as Moswell soil. Raylake soils are clayey. The included soils make up about 20 percent of the mapped areas.

This Moswell soil is used mainly as woodland and is moderately suited to pines. Hardwoods are generally of poor quality. Although this is not one of the better timber soils in the county, it produces quality timber if managed properly. Natural reproduction on this soil is generally prolific. Larger trees tend to have crooked trunks because of the high shrink-swell potential. Planting pine seedlings is difficult because of the clayey subsoil. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is not suited to crops because of the very severe erosion hazard.

This soil is poorly suited to pasture and hayland grasses because of the clayey subsoil, the thin surface layer, and wetness early in spring. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as common bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as crimson clover and vetch.

This soil is not suited to most orchard crops because of steepness of slope, the clayey subsoil, and the erosion hazard.

This soil is poorly suited to urban and recreational uses. Very slow permeability is a severe limitation for septic tank absorption fields and recreation areas. Other limiting features are high shrink-swell potential, high corrosivity to uncoated steel and concrete, and low strength as it affects roads and streets. Slope and erodibility also affect some recreational uses. Proper design and installation to partly overcome these problems are costly.

This Moswell soil is in capability subclass VIe and in woodland ordination group 8C.

MuB—Moswell-Urban land complex, 1 to 5 percent slopes. This complex is made up of gently sloping Moswell soil and Urban land. The soil in this complex is on broad interstream divides that are smooth and slightly concave to slightly convex. The complex is about 50 percent Moswell soil, 35 percent Urban land, and 15 percent other soils. This soil and Urban land are so intricately mixed that separation is not practical at the scale used in mapping.

Typically, the soil has a loam surface layer about 7 inches thick that is dark brown to a depth of 5 inches and pale brown below that. The subsoil to a depth of 35 inches is red plastic and sticky clay. It has light brownish gray mottles from 15 to 27 inches and light brownish gray and strong brown mottles from 27 to 35 inches. To a depth of 48 inches, the subsoil is grayish brown clay that has red and strong brown mottles. The underlying material is shaly clay. Moswell soil is moderately well drained and very slowly permeable.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that identification is not feasible. It is drained mainly through sewer systems, gutters, culverts, and surface ditches.

Included with this complex in mapping are small areas of Fuller and Herty soils. These soils generally are on lower landscapes than Moswell soil. Fuller soils are less clayey than Moswell soil, and Herty soils are dominantly grayish throughout.

This Moswell soil is poorly suited to urban and recreational uses. Very slow permeability is a limitation for septic tank absorption fields and recreation areas. Other limiting features are the high shrink-swell potential, high corrosivity to uncoated steel and concrete, and low strength as it affects roads and streets. Proper design

and installation to partly overcome these limitations are costly.

This complex is not placed in a capability subclass or in a woodland ordination group.

Mx—Moten-Multey complex, gently undulating. This complex consists of Moten soil in lows and Multey soil on mounds. These soils are on nearly level, moundy stream terraces. These wind-modified terraces are near most major streams south of the Yegua and Cook Mountain Formations. The mapped areas are about 100 acres.

A typical mapped area contains about 50 percent lows or intermounds of Moten soil, 40 percent mounds of Multey soil, and 10 percent other soils. The low areas are sinuous and vary greatly in length, but they are commonly 60 to 150 feet wide. Low areas completely surrounded by mounds can be inundated by 2 to 4 inches of water. The mounds are generally rounded and are 1.5 to 5.0 feet in height and 80 to 300 feet wide.

Moten soil has a silt loam surface layer about 26 inches thick that is dark grayish brown to a depth of 4 inches and grayish brown below that. Yellowish brown mottles are at a depth of 9 to 26 inches. To a depth of 52 inches, the subsoil is dark grayish brown silt loam that has tongues of light brownish gray. It contains yellowish red mottles at a depth of 46 to 52 inches. The underlying material to a depth of 65 inches is dark grayish brown clay loam.

Multey soil has a fine sandy loam surface layer about 25 inches thick that is dark grayish brown to a depth of 5 inches, brown from 5 to 18 inches, and pale brown with stains of brownish yellow below that. To a depth of 38 inches, the subsoil is pale brown fine sandy loam that has spots of yellowish brown with light brownish gray mottles. From 38 to 65 inches, it is yellowish brown loam that has tongues of grayish brown in the upper part and mottles of red and tongues of light gray in the lower part. The underlying material is grayish brown fine sandy loam.

Moten soil is somewhat poorly drained and slowly permeable. It is covered with water for short periods late in winter and early in spring. A perched water table is at a depth of about 18 inches during this time. Multey soil is moderately well drained and moderately permeable. A perched water table is at a depth of 30 to 40 inches late in winter. Both soils have a medium available water capacity. Water erosion is a slight hazard. Runoff is slow to medium on Multey soil and very slow on Moten soil.

The soils in this map unit are used mostly as woodland.

Moten soil is moderately suited to pine and hardwoods, and Multey soil is well suited. The wetness of Moten soil interferes with logging operations. Moten soil is well suited and Multey soil is moderately suited to the production of woodland understory plants for use by livestock and wildlife.

The soils in this complex are suited to most crops and vegetables, but they are not used for crops.

Moten soil is moderately suited and Multey soil is well suited to pasture and hayland grasses. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses and legumes.

Moten soil is not suited to orchard crops. Multey soil is well suited to peaches, plums, grapes, and berries.

Moten soil is poorly suited to most urban and recreational uses. The seasonal high water table and slow permeability are severe limitations for septic tank absorption fields. Wetness is a limitation for building sites, recreation areas, and roads and streets. Corrosivity to uncoated steel is also a limiting feature of this soil. Proper design and installation to overcome these problems are costly. The Multey soil is well suited to urban and recreational uses. Corrosivity to uncoated steel and wetness affecting some building sites are limiting features that can be overcome.

This complex is in capability subclass IIw. Moten soil is in woodland ordination group 8W, and Multey soil is in woodland ordination group 9A.

NaD—Naclina clay, 5 to 15 percent slopes. This deep soil is on strongly sloping side slopes above drainageways. It developed in calcareous marine deposits. The mapped areas are generally long and narrow.

Typically, this soil is clay throughout. The dark brown surface layer is 3 inches thick. To a depth of 30 inches, the subsoil is yellowish red. It has dark grayish brown mottles from depths of 14 to 30 inches. The subsoil is distinctly mottled light olive brown and grayish brown from 30 to 45 inches. The underlying material to a depth of 60 inches is strong brown and grayish brown laminated clay.

This soil is very slowly permeable and somewhat poorly drained. The available water capacity is high. Runoff is rapid to very rapid. Water erosion is a very severe hazard. A perched water table is less than 24 inches below the surface during wet periods in winter and early in spring.

Included in mapping are areas of Etoile soils that have a loam surface layer. The Etoile soils make up less than 5 percent of mapped areas.

Most of this Naclina soil is used for timber production. It is moderately suited to pine and hardwoods. Although this is not one of the better timber soils in the county, it produces quality timber if managed properly. Natural reproduction on this soil is generally prolific. Larger trees tend to have crooked trunks because of the high shrink-swell potential. Planting pine seedlings is difficult because of the clayey subsoil. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is not suited to use as cropland because of the erosion hazard.

This soil is only moderately suited to pasture and hayland grasses because of the clayey subsoil, the thin surface layer, and wetness early in spring. Fertilizer and grazing management are needed for the best production of adapted grasses, such as common bermudagrass. Some pastures are overseeded to legumes, such as arrowleaf and crimson clover and singletary peas.

This soil is not suited to most orchard crops because of the clayey texture and the erosion hazard.

This soil is poorly suited to urban and recreational uses. Wetness and very slow permeability are severe limitations for septic tank absorption fields, building sites, and recreation areas. The high shrink-swell potential, corrosivity to uncoated steel, and low strength and wetness as they affect roads and streets are other limitations. Caving of cutbanks is a hazard in excavation. The clayey surface layer affects many recreational uses. Proper design and installation to partly overcome these problems is expensive.

This Naclina soil is in capability subclass VIe and in woodland ordination group 6C.

Oz—Ozias silty clay, frequently flooded. This deep soil is in wet bottom land areas of the Neches River and adjoining major creeks. The mapped areas are long and parallel the river channel. Slope is less than 1 percent.

Typically, this soil has a silty clay surface layer that is dark grayish brown to a depth of 5 inches and dark gray from 5 to 10 inches. The subsoil is grayish brown silty clay loam to a depth of 18 inches. To a depth of 44 inches, it is dark gray silty clay that has strong brown mottles. The underlying material to a depth of 61 inches is grayish brown silty clay that has yellowish red mottles. It is dark gray silty clay loam to a depth of 80 inches.

This soil is very slowly permeable and somewhat poorly drained. It has medium available water capacity. A seasonal high water table fluctuates between the surface and a depth of 20 inches during wet seasons. Flooding generally occurs annually and lasts for several days.

Included in mapping are old wet sloughs and other low, wet areas. Also included are Koury and Pophers soils and some areas of Ozias soils that have slope of as much as 2 percent. Koury soils are on long, slightly higher ridges than Ozias soil. Pophers soils are on the same landscape as Ozias soil, but they are less clayey. White spots or salt spots are common in some pastures. The included soils make up as much as 20 percent of some mapped areas.

This soil is used almost entirely as woodland and is well suited to the production of quality hardwoods, such as water oak, willow oak, white oak, sweetgum, and swamp chestnut oak. Many areas have a dense stand of less desirable hardwoods, such as post oak and overcup oak. Pines are in areas of the included soils that are better drained and sandier, such as the natural levees deposited immediately beside the stream channel. Frequent flooding and extended wetness are problems on Ozias soil. Logging operations are limited to summer and fall. Pine seedlings should not be planted on this soil. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is not suited to crops, and it is not used as cropland. Wetness and the hazard of frequent flooding are limitations.

This soil is poorly suited to pasture and hayland grasses because of wetness and frequent flooding. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as improved bahiagrass. Some pastures are overseeded to legumes, such as white clover.

This soil is not suited to most orchard crops because of wetness and flooding.

This soil is not suited to urban and recreational uses. The hazard of frequent flooding of long duration and the high water table are limitations.

This Ozias soil is in capability subclass VIw and in woodland ordination group 10W.

Pa—Pits. This map unit consists of areas from which bentonite clay, or Fuller's Earth, has been extracted. These areas are in the extreme southern part of Angelina County. The excavations are old, recent, and some are on-going. The pits are generally less than 50 feet deep, but they vary greatly in size with the largest covering about 40 acres.

The pits often have nearly vertical sides that are bare of vegetation, and most have water in the bottom. Some pits that have water in the bottom are very deep. At the older sites, the mound of surface soil piled beside the pit is an artificial hill covered by trees.

This map unit is not placed in a capability subclass or in a woodland ordination group.

Po—Pophers silty clay loam, frequently flooded. This deep soil is on broad, uniform bottom lands of the Neches River flood plain and many of the larger creeks. Old stream channels occur without pattern and at irregular intervals. Slope is less than 1 percent.

Pophers soil is silty clay loam throughout. The surface layer is dark grayish brown to a depth of 4 inches and dark brown with grayish brown and yellowish red mottles from 4 to 10 inches. The subsoil is grayish brown with brown mottles to a depth of 24 inches and light gray with dark grayish brown and yellowish red mottles from 24 to 46 inches. To a depth of 65 inches, the underlying material is dark grayish brown with stains of yellowish red. The next layer to a depth of 80 inches is very dark grayish brown with yellowish brown mottles.

Pophers soil is somewhat poorly drained and slowly permeable. It has a medium available water capacity. Runoff is slow. This soil overflows 2 to 3 times per year in most years. Flooding lasts for several days. The water table is at or near the surface during the cool season.

Included in mapped areas of this soil are Ozias and Koury soils. Ozias soils are at the same elevation as Pophers soil, and Koury soils are in higher positions. Ozias soils have more than 35 percent clay. Koury soils have less clay than Pophers soil. In some pasture areas, white spots or salt spots are common. The included soils make up about 15 percent of some mapped areas.

This Pophers soil is used almost entirely as woodland and is well suited to the production of quality hardwoods, such as water oak, willow oak, white oak, and swamp chestnut oak. Many areas are infested with less desirable hardwoods, such as post oak, overcup oak, water hickory, and water locust. Pines grow on the included soils that are better drained and sandier, such as the soils deposited on natural levees immediately beside the stream channel. Frequent flooding and extended wetness are problems on this soil. Logging operations are limited to summer and fall. Pine seedlings should not be planted on this soil. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is not suited to crops, and it is not used as cropland. Wetness and the hazard of frequent flooding are limitations.

This soil is poorly suited to pasture and hayland grasses because of wetness and frequent flooding. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as improved bahiagrass. Some pastures are overseeded to legumes, such as white clover.

This soil is not suited to most orchard crops because of wetness and flooding.

This soil is not suited to urban and recreational uses. The hazard of frequent flooding of long duration and the high water table are limitations.

This Pophers soil is in capability subclass Vw and in woodland ordination group 8W.

RaB—Rayburn fine sandy loam, 1 to 5 percent slopes. This deep soil is on gently sloping interstream divides in the extreme southern part of the county. This soil is primarily in the Catahoula Formation. The mapped areas are about 80 acres.

This soil has a fine sandy loam surface layer about 8 inches thick that is dark grayish brown to a depth of 4 inches and grayish brown below that. The subsoil is clay. It extends to a depth of 50 inches. To a depth of 21 inches, it is red with light brownish gray mottles from 12 to 21 inches. To a depth of 30 inches, the subsoil is mottled light brownish gray and red. Below that, it is light brownish gray with strong brown mottles. The underlying material is light gray tuffaceous sandstone.

This soil is moderately well drained and very slowly permeable. It has a medium available water capacity. Runoff is rapid. Water erosion is a severe hazard.

Included in mapped areas are Corrigan soils that have a grayish clay subsoil and small spots of Browndell soils that are shallow. The included soils make up less than 20 percent of mapped areas.

This Rayburn soil is used entirely as woodland. It is well suited to pines, but hardwood trees are generally of poor quality. Erosion is a severe hazard for logging or logging roads. Generally, longleaf pines are dominant on this soil, but loblolly pines also grow well. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is poorly suited to crops, and it is not used as cropland. The hazard of erosion is a limitation.

This soil is poorly suited to pasture and hayland grasses because of the rapid runoff and the sticky clay subsoil. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as arrowleaf clover.

This soil is not suited to most orchard crops because of the clayey subsoil.

This soil is poorly suited to urban uses and moderately suited to recreational uses. Wetness and very slow permeability are severe limitations for septic tank absorption fields. Other limitations are high corrosivity to uncoated steel and concrete, high shrink-swell potential, and low strength as it affects roads and streets. Very slow permeability is a limitation for recreational uses. Proper design and installation to partly overcome these problems are costly.

This Rayburn soil is in capability subclass IVe and in woodland ordination group 9C.

RaD—Rayburn fine sandy loam, 5 to 15 percent slopes. This deep soil is on strongly sloping, rolling hills and long, narrow breaks into drainageways in the southern part of the county. The mapped areas are about 80 acres.

This soil has a fine sandy loam surface layer about 6 inches thick that is dark grayish brown to a depth of 3 inches and brown below that. The subsoil is clay. It extends to a depth of 47 inches. To a depth of 25 inches, it is red with light brownish gray mottles from 11 to 25 inches. To a depth of 43 inches, the subsoil is mottled strong brown, light gray, and red, and below that, it is pale olive with olive yellow mottles. The underlying material is light gray tuffaceous sandstone.

This soil is moderately well drained and very slowly permeable. It has a medium available water capacity. Runoff is rapid. Water erosion is a very severe hazard.

Included in mapped areas are Kisatchie soils that have a grayish clay subsoil and small spots of Browndell soils that are shallow. The included soils make up less than 20 percent of mapped areas.

This Rayburn soil is used almost entirely as woodland. It is well suited to pines, but hardwood trees are generally of poor quality. Erosion is a severe hazard for logging or logging roads. Generally, longleaf pines are

dominant on this soil, but loblolly pines also grow well. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is not suited to crops, and it is not used as cropland. The hazard of erosion is a limitation.

This soil is poorly suited to pasture and hayland grasses because of the rapid runoff and the sticky clay subsoil. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as arrowleaf clover.

This soil is not suited to most orchard crops because of the clay subsoil, steepness of slope, and the hazard of erosion.

This soil is poorly suited to urban and recreational uses. Wetness and very slow permeability are severe limitations for septic tank absorption fields. Other limitations are high corrosivity to uncoated steel and concrete, high shrink-swell potential, and low strength as it affects roads and streets. Very slow permeability, slope, and erodibility are limiting features for recreational uses. Proper design and installation to partly overcome these problems are costly.

This Rayburn soil is in capability subclass VIe and in woodland ordination group 9C.

RkB—Raylake clay loam, 0 to 4 percent slopes. This deep soil is in nearly level or gently sloping areas on uplands mainly south of Lufkin. The surface is covered with small humps or gilgai that are about 4 inches higher than the microlows. During wet weather, these humps cause small pockets of water to stand on the surface.

This soil typically has a dark grayish brown clay loam surface layer about 4 inches thick. To a depth of 51 inches, the subsoil is sticky and plastic clay. It is mottled red and light brownish gray to a depth of 11 inches and light brownish gray with yellowish red mottles below that. The underlying material is layered light yellowish brown and light brownish gray clay that contains gypsum.

This soil is very slowly permeable and somewhat poorly drained. It has a medium available water capacity. Runoff is medium. Water erosion is a moderate hazard.

Included in mapped areas of this soil are small areas of Moswell and Etoile soils. These soils make up about 15 percent of some mapped areas.

This soil is used almost entirely as woodland. It is moderately suited to pine and hardwoods. Although this is not one of the better timber soils in the county, it produces quality timber if managed properly. Natural reproduction on this soil is generally prolific. Larger trees tend to have crooked trunks because of the high shrink-swell potential. Planting pine seedlings is difficult because of the clayey subsoil. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

Although only a few acres of this soil are used as cropland, the soil is moderately suited to crops, such as corn, and to some truck crops.

This soil is moderately suited to pasture and hayland grasses because of the clayey subsoil, the thin surface layer, and wetness early in spring. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass, common bermudagrass, and improved bahiagrass. Some pastures are overseeded to legumes, such as crimson clover, vetch, and singletary peas.

This soil is not suited to most orchard crops because of wetness and the clay subsoil.

This soil is poorly suited to urban and recreational uses. Wetness and very slow permeability are severe limitations for septic tank absorption fields, building sites, and recreation areas. High corrosivity to uncoated steel and concrete, very high shrink-swell potential, and low strength as it affects roads and streets are also limitations. Proper design and installation to partly overcome these problems are costly.

This Raylake soil is in capability subclass IIIe and in woodland ordination group 8C.

RnB—Rentzel loamy fine sand, 0 to 4 percent slopes. This soil is in colluvial or toe slope positions in most of the sandy parts of the county. Most areas of this soil are parallel on both sides of a spring-fed, flowing stream. Continuous-flowing springs originate in some areas of this soil. The mapped areas are mostly long and narrow and range from 5 to 80 acres.

This soil typically has a loamy fine sand surface layer about 24 inches thick that is dark grayish brown to a depth of 7 inches and pale brown with light brownish gray mottles below that. The subsoil to a depth of 60 inches is sandy clay loam. It is strong brown with light brownish gray and yellowish red mottles from 24 to 30 inches; mottled strong brown, light brownish gray, and yellowish red from 30 to 45 inches; and light brownish gray with strong brown and red mottles below that.

This soil is somewhat poorly drained and moderately slowly permeable. It has a medium available water capacity. A high water table is at a depth of 1.5 to 2.5 feet during the cool season. Water erosion is a slight hazard.

Included in mapped areas of this soil are Lilbert and Keltys soils and a soil similar to Rentzel soil but has a black sandy surface layer and is much wetter. Libert soils are on slightly higher knolls than Rentzel soil. Keltys soils have a fine sandy loam surface layer. The included soils make up about 10 percent of some mapped areas.

This Rentzel soil is used mainly as woodland and is well suited to pines and hardwoods. Wetness early in spring or late in winter causes problems with logging and planting seedlings. This soil is well suited to the

production of woodland understory plants for use by livestock and wildlife.

This soil is moderately suited to some crops, but it is not used as cropland.

This soil is well suited to pasture and hayland grasses. Limiting features include wetness early in spring. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as arrowleaf clover.

This soil is not suited to most orchard crops because of wetness.

The Rentzel soil is moderately suited to most urban and recreational uses. Wetness and moderately slow permeability are limitations for septic tank absorption fields, building sites, and recreation areas. Corrosivity is a limiting feature to uncoated steel and concrete, and the sandy surface texture affects some recreational uses. Caving of cutbanks is a hazard in excavation. Most of these problems can be overcome with good design and installation.

This Rentzel soil is in capability subclass IIIw and in woodland ordination group 9W.

RoB—Rosenwall fine sandy loam, 1 to 5 percent slopes. This moderately deep soil is in gently sloping slightly convex to slightly concave areas on uplands. The mapped areas are irregular in shape and are mainly less than 50 acres.

Rosenwall soil typically has a fine sandy loam surface layer about 7 inches thick that is dark grayish brown to a depth of 4 inches and brown below that. The subsoil to a depth of 23 inches is red clay that has light gray mottles from depths of 15 to 23 inches. To a depth of 27 inches, the subsoil is red, grayish brown, yellowish brown, and light gray platy clay. The underlying material is alternate layers of siltstone and sandstone.

This soil is moderately well drained and very slowly permeable. It has a low available water capacity. Runoff is medium. Water erosion is a moderate hazard.

Included in mapped areas of this soil are small areas of Sacul and Moswell soils. Sacul soils are in small concave areas, and Moswell soils are on the same landscape as Rosenwall soil. The included soils make up less than 20 percent of the mapped areas.

This Rosenwall soil is used mainly as woodland and is moderately suited to pines. It does not grow good quality hardwood. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

Only a few acres of this soil are used as cropland. This soil is poorly suited to crops, such as corn, and to some truck crops.

This soil is moderately suited to pasture and hayland grasses because of very slow permeability and the hazard of erosion. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass, common bermudagrass, and improved bahiagrass. Some pastures are overseeded to legumes, such as arrowleaf clover.

This soil is not suited to most orchard crops because of the clayey subsoil.

This soil is poorly suited to most urban uses and moderately suited to recreational uses. Depth to rock and very slow permeability are limitations for septic tank absorption fields and recreation areas; and the shrink-swell potential is a limitation for building sites and for roads and streets. Corrosivity to uncoated steel and concrete and low strength as it affects roads and streets are also limitations. Proper design and installation are costly, but most of these problems can be overcome.

This Rosenwall soil is in capability subclass IVe and in woodland ordination group 7C.

RoD—Rosenwall fine sandy loam, 5 to 15 percent slopes. This moderately deep soil is on strongly sloping side slopes and hills. The land surface is slightly convex to slightly concave. The mapped areas are irregular in shape and are mostly less than 50 acres.

Rosenwall soil typically has a fine sandy loam surface layer about 6 inches thick that is dark grayish brown to a depth of 3 inches and pale brown below that. The subsoil to a depth of 17 inches is red clay that has light brownish gray mottles from 12 to 17 inches. To a depth of 25 inches, it is stratified red and light gray clay. The underlying material is alternate layers of siltstone and sandstone.

This soil is moderately well drained and very slowly permeable. It has a low available water capacity. Runoff is medium. Water erosion is a severe hazard.

Included in mapped areas of this soil are small areas of Sacul and Cuthbert soils. Sacul soils are in small concave areas, and Cuthbert soils are on the same landscape as Rosenwall soil. The included soils make up less than 20 percent of the mapped areas.

This Rosenwall soil is used mainly as woodland and is moderately suited to pines. It does not grow good quality hardwoods. Because of the severe erosion hazard, great care should be used before preparing a site or planting. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is not suited to crops, and it is not used as cropland. The hazard of erosion is a limitation.

This soil is poorly suited to pasture and hayland grasses because of the very slow permeability and erosion hazard. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as common bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as crimson and arrowleaf clover.

This soil is not suited to most orchard crops because of steepness of slope, the clayey subsoil, and the hazard of erosion.

This soil is poorly suited to most urban uses and suited to recreational uses. Depth to rock and very slow permeability are limitations for septic tank absorption fields and recreation areas, and the shrink-swell potential is a limitation for building sites and for roads and streets. Corrosivity to uncoated steel and concrete and low strength as it affects roads and streets are limitations. Slope and erodibility are limitations to some building sites and recreation areas. Proper design and installation are costly but most of these problems can be overcome.

This Rosenwall soil is in capability subclass VIe and in woodland ordination group 7C.

SaB—Sacul fine sandy loam, 1 to 5 percent slopes. This deep soil is in gently sloping, slightly convex to slightly concave areas at the head of drainageways. It is in all parts of the county. The mapped areas are irregular in shape and are mainly less than 50 acres.

Sacul soil typically has a fine sandy loam surface layer about 8 inches thick that is dark brown to a depth of 5 inches and brown below that. To a depth of 27 inches, the subsoil is red clay that has light brownish gray mottles from 16 to 27 inches. It is mottled red, light gray, and strong brown to a depth of 56 inches. It is clay from 35 to 47 inches and clay loam from 47 to 56 inches. The underlying material is alternate layers of light gray shale and strong brown to yellowish red sandstone.

This soil is moderately well drained and slowly permeable. It has a high available water capacity. Runoff is medium. Water erosion is a moderate hazard.

Included in mapping are small areas of Keithville and Kirvin soils. Keithville soils are in small concave areas, and Kirvin soils are on knolls. Also included are some small areas of Sacul soils that are eroded. The included soils make up less than 20 percent of the mapped areas.

This Sacul soil is used mainly as woodland and is moderately suited to pine. It has an average ability to produce woodland products and has few problems with establishment of natural or planted pines. The soil on steeper slopes is erosive, and care should be taken in logging and site preparation. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

Although only a few acres of this soil are used as cropland, the soil is moderately suited to crops, such as corn, and to some truck crops.

This soil is moderately suited to pasture and hayland grasses. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as arrowleaf clover.

This soil is not suited to most orchard crops because of the clayey subsoil.

This soil is poorly suited to most urban uses and moderately suited to most recreational uses. Slow permeability is a limitation for septic tank absorption fields and recreation areas, and the shrink-swell potential is a limitation for building sites and roads and streets. Corrosivity to uncoated steel and low strength as it affects roads and streets are also limitations. Good design and installation are costly, but most of these problems can be overcome.

This Sacul soil is in capability subclass IIIe and in woodland ordination group 8C.

SaD—Sacul fine sandy loam, 5 to 15 percent slopes. This deep soil is on strongly sloping, rolling hills and long narrow breaks into drainageways in nearly all parts of the county. The mapped areas are about 80 acres. This is one of the most extensive soils in the county.

Sacul soil has a fine sandy loam surface layer about 9 inches thick that is dark grayish brown to a depth of 2 inches, brown from 2 to 6 inches, and pale brown below that. The subsoil is clay. It extends to a depth of 44 inches. To a depth of 18 inches, the subsoil is red with light brownish gray mottles, and from 18 to 26 inches, it is mottled red and light brownish gray. The subsoil is light gray with red mottles from 23 to 37 inches and grayish brown with yellowish red mottles from 37 to 44 inches. The underlying material is light brownish gray shale and siltstone that has layers of strong brown soft sandstone.

This soil is moderately well drained and slowly permeable. It has a high available water capacity. Runoff is rapid. Water erosion is a severe hazard.

Included in mapped areas are Cuthbert and Kirvin soils and a Sacul soil that has slope of less than 5 percent. Cuthbert soils are less than 40 inches thick, and Kirvin soils have a red clayey subsoil. The included soils make up less than 20 percent of mapped areas. Cuthbert soils make up 10 to 15 percent of the included soils.

This Sacul soil is used almost entirely as woodland. It is suited to pines and has few problems with establishment of natural or planted pines. This soil has average ability to produce woodland products. The soil on steeper slopes is erosive, and care should be taken in logging and site preparation. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is not suited to crops, and it is not used as cropland. The hazard of erosion is a limitation.

This soil is moderately suited to pasture and hayland grasses because of the erosion hazard and slow water intake. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as common bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as crimson clover.

This soil is not suited to most orchard crops because of the clayey subsoil, steepness of slope, and the erosion hazard.

This soil is poorly suited to most urban uses and moderately suited to most recreational uses. Slow permeability is a limitation for septic tank absorption fields and recreation areas, and the shrink-swell potential is a limitation for building sites and roads and streets. Corrosivity to uncoated steel and concrete and low strength as it affects roads and streets are also limitations. Slope is also a limitation for some building sites and recreational uses. Good design and installation are costly, but most of these problems can be overcome.

This Sacul soil is in capability subclass VIe and in woodland ordination group 8C.

SbB—Sacul-Urban land complex, 1 to 5 percent slopes. This complex of gently sloping Sacul soil and Urban land is on slightly convex uplands. It is about 45 percent Sacul soil, 35 percent Urban land, and 20 percent other soils. This soil and Urban land are so intricately mixed that separation is not practical at the scale used in mapping.

Typically, Sacul soil has a fine sandy loam surface layer about 9 inches thick that is very dark grayish brown in the upper part and brown in the lower part. To a depth of 37 inches, the subsoil is red clay that has light brownish gray mottles in the lower part. To a depth of 54 inches, it is mottled red, light brownish gray, and strong brown clay. The underlying material is alternate layers of sandstone and shale. Sacul soil is moderately well drained and slowly permeable.

The Urban land part of this complex is covered by streets, parking lots, buildings and other structures that obscure or alter the soils so that identification is not feasible. It is drained mainly through sewer systems, gutters, culverts, and surface ditches.

Included with this complex in mapping are small areas of Keithville and Kirvin soils. Keithville soils are in small concave areas, and Kirvin soils are on knolls. Keithville and Kirvin soils are moderately slowly permeable.

This Sacul soil is poorly suited to most urban uses and moderately suited to most recreational uses. The slow permeability is a limitation for septic tank absorption fields and recreation areas, and the shrink-swell potential is a limitation for building sites and roads and streets. Corrosivity to uncoated steel and low strength as it affects roads and streets are also limitations. Good design and installation are costly, but most of these problems can be overcome.

This complex is not placed in a capability subclass or in a woodland ordination group.

StD—Stringtown fine sandy loam, 5 to 15 percent slopes. This deep soil is on broad, strongly sloping hills and side slopes above drainageways. Narrow ridges and knobs normally have 5 to 10 percent gravel content in the surface layer. The mapped areas are long and narrow and are over 100 acres.

Stringtown soil typically has a fine sandy loam surface layer about 12 inches thick that is dark grayish brown to a depth of 7 inches and pale brown below that. The subsoil, to a depth of 41 inches, is strong brown sandy clay loam that has red mottles from 24 to 41 inches. To a depth of 50 inches, it is layered yellowish brown to red weathered sandstone and light gray shale. The underlying material is strong brown and red soft sandstone interbedded with thin layers of gray shale.

Stringtown soil is well drained and moderately permeable. It has a medium available water capacity. Runoff is medium. Water erosion is a severe hazard.

Included in mapped areas of this soil are Tenaha and Letney soils. Tenaha soils are on knobs and ridges. Letney soils have a sandy surface layer 20 to 40 inches thick. The included soils make up less than 10 percent of the map unit.

This Stringtown soil is used mainly as woodland and is well suited to this use. Under natural conditions, most areas of this soil are dominated by longleaf pines; however, loblolly and shortleaf pines grow well. In many plantations, slash pines have been used for seedlings. This soil is moderately suited to the production of woodland understory plants for use by livestock and wildlife (fig. 16). Rapid development of overstory and plant competition reduce production.

This soil is not suited to crops, and it is not used as cropland. The hazard of erosion is a limitation.

This soil is moderately suited to pasture and hayland grasses because of lack of soil moisture during summer. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and common bermudagrass. Some pastures are overseeded to legumes, such as vetch and arrowleaf clover.

This soil is not suited to most orchard crops because of the steepness of slope and the hazard of erosion.

This soil is moderately suited to most urban and recreational uses. Slope, corrosivity to concrete, and low strength as it affects roads and streets are the limiting features.

This Stringtown soil is in capability subclass VIe and in woodland ordination group 9A.

StF—Stringtown fine sandy loam, 15 to 35 percent slopes. This deep soil is on moderately steep to steep side slopes above drainageways. Narrow ridges and knobs normally have 5 to 10 percent gravel content in the surface layer. The mapped areas are long and narrow and are over 100 acres.

This soil typically has a fine sandy loam surface layer about 9 inches thick. It is dark grayish brown to a depth of 5 inches and light yellowish brown from 5 to 9 inches. The subsoil is sandy clay loam to a depth of 41 inches. To a depth of 36 inches, it is strong brown with red mottles from depths of 23 to 36 inches. Below that, the subsoil is yellowish brown with red and light gray

Figure 16.—Stand of longleaf and loblolly pines on Stringtown fine sandy loam, 5 to 15 percent slopes. The understory plants can be used by livestock and wildlife.

mottles. The underlying material is soft yellowish brown to red sandstone interbedded with thin layers of gray shale.

Stringtown soil is well drained and moderately permeable. It has a medium available water capacity. Runoff is medium. Water erosion is a very severe hazard.

Included in mapped areas of this soil are Tenaha and Letney soils. Tenaha soils are on knobs and ridges. Letney soils have a sandy surface layer 20 to 40 inches thick. The included soils make up less than 10 percent of the mapped areas.

All of this Stringtown soil is used as woodland, and it is moderately suited to this use. Under natural conditions, most areas of this soil are dominated by longleaf pines; however, loblolly and shortleaf pines grow well. In many plantations, slash pines have been used for seedlings. This soil is moderately suited to the production of woodland understory plants for use by livestock and wildlife. Reduced soil moisture and plant competition reduce production.

This soil is not suited to crops, and it is not used as cropland. The hazard of erosion and steep slopes are limitations.

This soil is not suited to pasture and hayland grasses. Limiting features include the erosion hazard and equipment use limitations on slopes.

This soil is not suited to most orchard crops because of the slope and the hazard of erosion.

This soil is poorly suited to most urban and recreational uses because of steepness of slope.

This Stringtown soil is in capability subclass VIIe and in woodland ordination group 6R.

TeD—Tehran loamy sand, 8 to 15 percent slopes. This deep soil is in strongly sloping areas that parallel drainageways for long distances. Many springs are at the base of slopes of this soil. The mapped areas are long and narrow and are about 50 acres.

This soil has a loamy sand surface layer about 53 inches thick. It is dark grayish brown to a depth of 4 inches, brown from 4 to 9 inches, and pale brown from 9 to 53 inches. The subsoil to a depth of 80 inches is sandy clay loam that is mottled yellowish red and strong brown.

This soil is somewhat excessively drained and moderately rapidly permeable. It has a low available water capacity. Runoff is slow to medium. Water erosion is a severe hazard.

Included in mapped areas of this soil are Tenaha soils on ridges and Rentzel soils on the bottom or lowest part of the slope. Tenaha soils have a sandy surface layer less than 40 inches thick. Rentzel soils are slightly wet. The included soils make up less than 20 percent of the mapped areas.

Most areas of this Tehran soil are in forest. Very few acres have been cleared for pasture.

This soil is moderately suited to woodland. It is generally droughty and is best suited to pines. Most areas are dominated by longleaf pine. In clearcut and site prepared areas, seedling mortality is severe because of the low available water in the surface layer. Seedlings survive better if planted under the protective cover of other trees. These older trees can later be controlled by mechanical or chemical methods. Woodland production varies greatly on this soil because at the varying thickness of the sandy surface layer and varying moisture on different parts of the slope. Generally, the lower slopes are better sites than the upper slopes. This soil is moderately suited to the production of woodland understory plants for use by livestock and wildlife. The low available moisture of the surface layer can reduce production.

This soil is poorly suited to most crops, and only a few acres are used as cropland. The hazard of erosion is a limitation.

This soil is poorly suited to pasture and hayland grasses because of the low available moisture and natural low fertility. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and weeping lovegrass.

This soil is not suited to most orchard crops because of the hazard of erosion.

Tehran soil is moderately suited to most urban and recreational uses. Steepness of slope, the sandy surface layer, and corrosivity to concrete are limitations. Caving of cutbanks is a hazard in excavation, and seepage is a limiting feature for most sanitary facilities.

This Tehran soil is in capability subclass VIe and in woodland ordination group 8S.

TnD—Tenaha loamy fine sand, 5 to 15 percent slopes. This deep soil is on wide, strongly sloping hills and narrow side slopes above drainageways. Narrow ridges and knobs normally have 5 to 10 percent gravel content in the surface layer. The mapped areas are long and narrow and are about 60 acres.

This soil typically has a loamy fine sand surface layer about 25 inches thick that is dark grayish brown to a depth of 5 inches and pale brown below that. The subsoil extends to a depth of 56 inches. It is strong brown sandy clay loam that has yellowish red mottles in the upper part and red mottles in the lower part. The underlying material is yellowish red and strong brown soft sandstone.

Tenaha soil is well drained and moderately permeable. It has a medium available water capacity. Runoff is medium. Water erosion is a severe hazard.

Included in mapped areas of this soil are knobs and ridges of a soil that contains 15 to 25 percent iron-manganese gravel and is similar to Tenaha soil. Also included are Darco soils that have a sandy surface layer more than 40 inches thick. The included soils make up less than 10 percent of the mapped areas.

This Tenaha soil is used mainly as pasture and woodland.

This soil is moderately suited to pine and has moderate problems for establishing seedlings. It can be logged almost any season without damage to the soil or equipment. This soil is moderately suited to the production of woodland understory plants for use by livestock and wildlife. Droughtiness during summer reduces production.

This soil is not suited to crops, and it is not used as cropland. The hazard of erosion is a limitation.

This soil is well suited to pasture and hayland grasses. Limiting features include the droughty, sandy surface layer. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and weeping lovegrass. Some pastures are overseeded to legumes, such as vetch.

This soil is not suited to most orchard crops because of the hazard of erosion.

This soil is well suited to most urban and recreational uses. Steepness of slope and the sandy surface layer are the main limiting factors. Caving of cutbanks is a hazard in excavation.

This Tenaha soil is in capability subclass VIe and in woodland ordination group 8S.

WoB—Woodtell very fine sandy loam, 1 to 5 percent slopes. This deep soil is on gently sloping, broad ridges. It developed in marine shales and clays. In some areas, the surface has small humps or gilgai about 2 to 3 inches high.

This soil has a very fine sandy loam surface layer about 4 inches thick that is dark grayish brown to a depth of 2 inches and pale brown below that. The subsoil is plastic and sticky clay. It extends to a depth of 41 inches. It is red to a depth of 10 inches and mottled yellowish red and light gray to a depth of 38 inches. From 38 to 41 inches, the subsoil is mottled light gray and yellowish red and has small spots of olive gray shale. The underlying material to a depth of about 60 inches is olive yellow and light gray shale.

Woodtell soil is very slowly permeable and moderately well drained. It has a medium available water capacity. Water erosion is a severe hazard.

Included in mapped areas of this soil are some Lacerda soils and some Woodtell soil that has slope of more than 5 percent. The Lacerda soils are clayey throughout. The included soils make up less than 20 percent of mapped areas.

This soil is used mainly as woodland. It is moderately suited to pines but does not produce quality hardwoods. Because of the sticky and plastic, clayey subsoil, machine planting of seedlings is difficult. In many areas, the high shrink-swell potential causes larger trees to have crooked trunks. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is poorly suited to crops, and at present, it is not used as cropland. The plastic, clayey subsoil is a limitation.

This soil is moderately suited to pasture and hayland grasses. Limiting features include very slow permeability. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as singletary peas.

This soil is not suited to most orchard crops because of the clay subsoil.

This soil is poorly suited to most urban and recreational uses. Very slow permeability is a limitation for septic tank absorption fields and recreation areas, and the shrink-swell potential is a limitation for building sites and for roads and streets. High corrosivity to uncoated steel and concrete and low strength as it affects roads and streets are also limiting features. Proper design and installation are costly, but most of these problems can be overcome.

This Woodtell soil is in capability subclass IIIe and in woodland ordination group 7C.

WoD—Woodtell very fine sandy loam, 5 to 15 percent slopes. This deep soil is on strongly sloping side slopes above drainageways. It developed in clayey marine deposits. The mapped areas are mainly long and narrow.

This soil typically has a very fine sandy surface layer about 8 inches thick that is dark grayish brown to a depth of 4 inches and pale brown below that. The subsoil is clay. It extends to a depth of 51 inches. The subsoil is red to a depth of 15 inches and red and light brownish gray from 15 to 37 inches. To a depth of about 51 inches, it is light brownish gray with yellowish red mottles. The underlying material to a depth of at least 65 inches is light brownish gray shale.

This soil is very slowly permeable and moderately well drained. It has a medium available water capacity. Water erosion is a severe hazard.

Included in mapped areas of this soil are Rosenwall and Lacerda soils. Rosenwall soils are less clayey and more acid than Woodtell soil. Lacerda soils are clayey throughout. The included soils make up about 20 percent of mapped areas.

Most of this soil is used as woodland. It is moderately suited to pines but does not produce quality hardwoods. Because of the sticky and plastic, clayey subsoil, machine planting of seedlings is difficult. In many areas, the high shrink-swell potential causes larger trees to have crooked trunks. This soil is well suited to the production of woodland understory plants for use by livestock and wildlife.

This soil is not suited to crops, and it is not used as cropland. The hazard of erosion is a limitation.

This soil is poorly suited to pasture and hayland grasses because of the rapid runoff and very slow permeability. Equipment use limitations are a concern in management. Fertilizer, lime, and grazing management are needed for the best production of adapted grasses, such as coastal bermudagrass and improved bahiagrass. Some pastures are overseeded to legumes, such as singletary peas.

This soil is not suited to most orchard crops because of the clay subsoil and the hazard of erosion.

This soil is poorly suited to most urban and recreational uses. Very slow permeability is a limitation for septic tank absorption fields and recreational areas, and the shrink-swell potential is a limitation for building sites and for roads and streets. High corrosivity to uncoated steel and concrete and low strength as it affects roads and streets are also limiting features. Slope is a limitation for some building sites and recreation areas. Proper design and installation are costly, but most of these problems can be overcome.

This Woodtell soil is in capability subclass VIe and in woodland ordination group 7C.

Prime Farmland

Each year thousands of acres of land throughout the United States are converted from agricultural to industrial, urban, and other uses. Some of this land is prime farmland. This section provides information about the prime farmland in Angelina County. It defines prime farmland and lists the prime farmland soils in the county.

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be sufficiently long. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources. Farming these soils results in the least damage to the environment.

Prime farmland soils may presently be in use as cropland, pasture, or woodland, or they may be in other uses. They either are used for producing food or fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water control structures. Public land is land not available for farming in national forests, national parks, military reservations, and state parks.

Prime farmland soils usually get an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not subject to frequent flooding during the growing season. The slope is mainly less than 6 percent.

About one-third of the 553,619 acres of Angelina County is prime farmland. Prime farmland is scattered throughout the county, but map units 1, 2, and 3 of the general soil map have the largest areas. Map units 10, 11, and 14 have substantial areas of prime farmland, and map unit 8 has only small, scattered areas.

A recent trend in some parts of the county has been the conversion of prime farmland to urban and industrial uses. Such loss of prime farmland to nonfarm uses increases farming on less suitable soils that generally are more erodible and droughty, are difficult to cultivate, and are less productive.

The detailed soil map units that make up the prime farmland in Angelina County are listed in this section. These units are prime farmland except where they are urban or built-up land or they fail to meet the criteria noted. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

Soils that have limitations, such as a high water table, flooding, or inadequate rainfall, may qualify as prime farmland if these limitations are overcome by corrective measures. In the following list, the measures needed to overcome the limitations of a map unit, if any, are shown in parentheses after the map unit name. Onsite evaluation is necessary to determine if the limitations have been overcome by the corrective measures.

Aab	Alazan very fine sandy loam, 0 to 4 percent slopes
Ab	Alazan-Besner complex, gently undulating
AtB	Attoyac fine sandy loam, 0 to 4 percent slopes
BaB	Bernaldo fine sandy loam, 0 to 3 percent slopes
Bb	Bernaldo-Besner complex, gently undulating
Iu	Iuka fine sandy loam, occasionally flooded
KaB	Keithville very fine sandy loam, 0 to 3 percent slopes
Kb	Keithville-Sawtown complex, gently undulating
KcB	Keltys fine sandy loam, 1 to 5 percent slopes
Ko	Koury loam, occasionally flooded
KuB	Kurth fine sandy loam, 0 to 4 percent slopes
Me	Marietta fine sandy loam, occasionally flooded

MoA Mollville loam, 0 to 1 percent slopes (if artificially drained)

Mp Mollville-Besner complex, gently undulating (if artificially drained)

Mx Moten-Multey complex, gently undulating

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern that is in harmony with nature.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Cropland

Cropland is of minor extent and importance in Angelina County. Home gardens, truck crops, and crops used for livestock feed are grown along roads and near homesites. The crops include corn, oats, soybeans, tomatoes, watermelons, and pears. Corn is the main crop grown for livestock feed.

Soils used as cropland are managed mainly to control water erosion, maintain tilth and fertility, and, in some cases, to drain off excess water. The major practices used to accomplish these purposes are:

Crop residue. Leaving crop residue on the soil helps to control water erosion and conserve moisture. Incorporating residue into the soil improves tilth and the available water capacity.

Contour farming. Terracing and farming on the contour help to control water erosion. This is beneficial on most soils that have slope of more than 1 percent.

Cover crops. Cover crops furnish protective cover after the crop has been harvested and before the next cultivated crop is planted. Some cover crops suitable for most soils in the survey area are small grain, vetch, and mixtures of annual grasses and legumes.

Fertilizer. Most crops respond well to commercial fertilizers. Soil fertility levels can be maintained if proper amounts and kinds of fertilizer are applied.

Pasture

Claude Compton, agronomist, Soil Conservation Service, prepared this section.

Improved pastures and meadows are the main source of forage for livestock in Angelina County. Improved or tame pastures include improved varieties of grasses and legumes that were established to obtain a higher production of forage crops (fig. 17). Most of the tame pastures in Angelina County are areas of old cropland that have been converted to grasses. The three major grasses in improved pastures are common bermudagrass, improved bermudagrass, and bahiagrass.

Improved bermudagrasses include coastal, Alicia, and Sheffield. Pensicola, Argentina, and Paraguay bahiagrass are grown. Crimson clover, Louisiana S-1 white clover, arrowleaf clover, hairy vetch, and singletary peas are the more important legumes overseeded in perennial grasses. Weeping lovegrass is used on some of the droughty, sandy soils.

All of the soils in the county need fertilizer for high production of good quality forage. Lime is also needed on most of the soils.

Adapted species and varieties of grasses and legumes best suited to the soils achieve higher yields. Weed and brush control, fertilizer, lime, proper grazing management, harvesting to insure the smallest possible loss, and livestock water management are needed. The proper mix of these management practices can help achieve good yields from poorly suited soils. Yields may increase as new varieties and new production technology are developed, but the productivity of a given soil compared with that of other soils is not likely to change.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that insures the smallest possible loss.

Figure 17.—Improved pasture in an area of Diboll very fine sandy loam, 1 to 4 percent slopes.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for use as cropland. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major, and generally expensive, landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for pastureland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit *(21)*. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode, but they have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class I because the soils of this class have few limitations. The soils in class V are subject to little or no erosion, but they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation. Class V contains only the subclasses indicated by *w, s,* or *c*.

Woodland Management and Productivity

Joe Daniel, area conservationist, and Ray Stoner, forester, Soil Conservation Service, prepared this section.

Angelina County has about 343,640 acres of woodland. They provide recreation, hunting and plant study as well as produce commercial wood products. Large industrial landowners own 250,000 acres; Angelina National Forest consists of 58,842 acres; the Corps of Engineers own 2,600 acres around Sam Rayburn Reservoir; and the remaining 32,198 acres are owned by individual landowners. Offices for several wood-related companies are located in Lufkin and Diboll. State offices for the U.S. Forest Service and the Texas Forestry Association headquarters are in Lufkin.

The soils and climate in Angelina County are well suited to the production of wood fiber, and extensive clearcutting, site preparation, and tree planting have been done. Production of thousands of acres could be greatly increased by improved management and removal of cull trees (fig. 18). Specific management information for various soils can be obtained from the Soil Conservation Service.

Plant communities in Angelina County range from droughty, sandy-type plants, such as longleaf pine, sandjack oak, blackjack oak, and shortleaf pine, to wet, marsh-type plants, such as southern sweetbay, water tupelo, water locust, and overcup oak.

Soils vary in their ability to produce trees. Depth, fertility, texture, and the available water capacity influence tree growth. Elevation, aspect, and climate determine the kinds of trees that can grow on a site. Available water capacity and the depth of the root zone are major influences of tree growth.

This soil survey can be used by woodland managers planning ways to increase the productivity of forest land. Some soils respond better to fertilization than others; some are more susceptible to erosion after roads are

Figure 18.—Well managed stand of timber in an area of Alazan very fine sandy loam, 0 to 4 percent slopes. Cull hardwood trees have been controlled by fire, and the stand has been properly thinned.

built and timber is harvested; and some require special efforts to reforest. In the section "Detailed soil map units," each map unit in the survey area suitable for producing timber presents information about productivity, limitations for harvesting timber, and management concerns for producing timber. The common forest understory plants are also listed. Table 6 summarizes this forestry information and rates the soils for a number of factors to be considered in management. *Slight, moderate*, and *severe* are used to indicate the degree of the major soil limitations to be considered in forest management.

The first tree listed for each soil under the column "Common trees" is the indicator species for that soil. An indicator species is a tree that is common in the area and that is generally the most productive on a given soil.

Table 6 lists the *ordination symbol* for each soil. The first part of the ordination symbol, a number, indicates the potential productivity of a soil for the indicator species based on its site index. The larger the number, the greater the potential productivity.

Loblolly pine is the indicator species for soils that grow pines. Soils having very high potential productivity (site indices of 95 or more) have a 10 or 11 as the first part

of the ordination symbol. A 9 represents soils that have high potential productivity (site index of 90); an 8, soils that have a moderately high potential productivity (site index of 80); a 7, soils that have moderate potential productivity (site index of 70); and for soils that have low potential productivity (site indices of 65 or less), the first part of the ordination symbol is 6 or less.

Sweetgum is the indicator species for soils that normally grow hardwoods only. Soils that have very high potential productivity (site indices of 100 or more) have a 10 or 11 as the first part of the ordination symbol. An 8 or 9 indicates soils that have high potential productivity (site indices between 90 and 100); a 6 or 7, soils that have moderately high potential productivity (site indices between 80 and 90); and for soils that have moderate potential productivity (site indices between 70 and 80), a 4 or 5 is the first part of the ordination symbol.

The second part of the ordination symbol, a letter, indicates the major kind of soil limitation for use and management. The letter *R* indicates a soil that has a significant limitation because of steepness of slope. The letter *W* indicates a soil in which excessive water, either seasonal or year-round, causes a significant limitation. The letter *D* indicates a soil that has a limitation because of restricted rooting depth, such as a shallow soil that is underlain by hard rock, hardpan, or other layers that restrict roots. The letter *C* indicates a soil that has a limitation because of the kind or amount of clay in the upper part of the soil. The letter *S* indicates a dry, sandy soil. The letter *F* indicates a soil that has a large amount of coarse fragments in the soil profile. The letter *A* indicates a soil that has no significant restrictions or limitations for forest use and management. If a soil has more than one limitation, the priority is as follows: R, W, D, C, S, and F.

Ratings of the *erosion hazard* indicate the probability that damage may occur if site preparation activities or harvesting operations expose the soil. The risk is *slight* if no particular preventive measures are needed under ordinary conditions; *moderate* if erosion control measures are needed for particular silvicultural activities; and *severe* if special precautions are needed to control erosion for most silvicultural activities. Ratings of *moderate* or *severe* indicate the need for construction of higher standard roads, additional maintenance of roads, additional care in planning of harvesting and reforestation operations, or use of specialized equipment.

Ratings of *equipment limitation* indicate limits on the use of forest management equipment, year-round or seasonal, because of such soil characteristics as slope, wetness, stoniness, or susceptibility of the surface layer to compaction. As slope gradient and length increase, it becomes more difficult to use wheeled equipment. On the steeper slopes, tracked equipment must be used. On the steepest slopes, even tracked equipment cannot operate; more sophisticated systems are needed. The rating is *slight* if equipment use is restricted by soil wetness for less than 2 months and if special equipment is not needed. The rating is *moderate* if slopes are steep enough that wheeled equipment cannot be operated safely across the slope, if soil wetness restricts equipment use from 2 to 4 months per year, if stoniness or sandy texture restricts ground-based equipment, or if special equipment is needed to avoid or reduce soil compaction. The rating is *severe* if slopes are steep enough that tracked equipment cannot be operated safely across the slope, if soil wetness restricts equipment use for more than 4 months per year, if stoniness or sandy texture restricts ground-based equipment, or if special equipment is needed to avoid or reduce soil compaction. Ratings of *moderate* or *severe* indicate a need to choose the most suitable equipment and to carefully plan the timing of harvesting and other management operations.

Ratings of *seedling mortality* refer to the probability of death of naturally occurring or properly planted seedlings of good stock in periods of normal rainfall as influenced by kinds of soil or topographic features. *Seedling mortality* is caused primarily by too much water or too little water. The factors used in rating a soil for seedling mortality are texture of the surface layer, depth and duration of the water table, rock fragments in the surface layer, and rooting depth. Mortality generally is greatest on soils that have a sandy or clayey surface layer. The risk is *slight* if, after site preparation, expected mortality is less than 25 percent; *moderate* if expected mortality is between 25 and 50 percent; and *severe* if expected mortality exceeds 50 percent. Ratings of *moderate* or *severe* indicate that it may be necessary to increase the planting rates per acre, to use containerized or larger than usual planting stock, or to make special site preparations, such as bedding, furrowing, installing surface drainage, or providing artificial shade for seedings. Reinforcement planting is often needed if the risk is *moderate* or *severe*.

Ratings of *plant competition* indicate the likelihood of the growth or invasion of undesirable plants. *Plant competion* becomes more severe on the more productive soils, on poorly drained soils, and on soils having a restricted root zone that holds moisture. The risk is *slight* if competition from undesirable plants reduces adequate natural or artificial reforestation but does not necessitate intensive site preparation and maintenance. The risk is *moderate* if competition from undesirable plants reduces natural or artificial reforestation to the extent that intensive site preparation and maintenance are needed. The risk is *severe* if competition from undesirable plants prevents adequate natural or artificial reforestation unless the site is intensively prepared and maintained. A *moderate* or *severe* rating indicates the need for site preparation to ensure the development of an adequately stocked stand.

Managers must plan site preparation measures to ensure reforestation without delays.

The potential productivity of *common trees* on a soil is expressed as a *site index*. Common trees are listed in the order of their observed general occurrence. Generally, only two or three tree species dominate.

The *site index* is determined by taking height measurements and determining the age of selected dominant and codominant trees within stands of a given species. This index is the average height, in feet, that the trees attain in a specified number of years, generally 30 years for cottonwood and 50 years for all other species. This index applies to fully stocked, even-aged, unmanaged stands.

The *productivity class* represents an expected volume produced by the most important trees, expressed in board feet (Doyle Rule) per acre per year. The annual yield figures apply to fully stocked, natural stands over a 50 year period. The stands do not have a history of any immediate cutting management. Therefore, applying sound forestry management practices, such as thinning, significantly increases the listed yields.

Trees to plant are those that are used for reforestation or, if suitable conditions exist, natural regeneration. They are suited to the soils and will produce a commercial wood crop. Desired product, topographic position (such as a low, wet area), and personal preference are three factors of many that can influence the choice of trees to use for reforestation.

Woodland Understory Vegetation

Claude Compton, agronomist, Soil Conservation Service, helped prepare this section.

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Woodlands, if well managed, can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

Livestock farming is the major agricultural enterprise in Angelina County. According to statistics from the 1978 Census of Agriculture, about 13,000 cattle were in the survey area. The cattle operations are mainly cow-calf. The major part of the forage needs are supplied by improved pastures; however, many farmers have woodlands that are grazed. Also, some cattlemen lease timber company or U.S. Forest Service lands for their cattle. More than 120,000 acres of forest land is grazed in the county.

Forage production is highest following clearcutting of an area. Herbage yields average about 1,500 pounds (air dry) per acre annually, and on choice sites, the yield can exceed 3,000 pounds. On grazed woodland that is periodically burned, grasses make up at least 80 percent of the vegetation; sedges, forbs, and shrubs make up the rest.

The density of the canopy determines the amount of light that reaches the understory plants. The canopy cover is the major factor affecting the production of vegetation within reach of livestock and large game animals. Good silvicultural practices, such as thinning of timber stands, removal of cull trees, and controlled burning, along with livestock management are necessary to maintain moderate to good production of understory vegetation. If these practices are not used, the canopy cover increases drastically because of the growth of shrubs and hardwoods in the midstory. A site that has closed canopy of 75 percent or more may not have sufficient carrying capacity for a profitable livestock operation. Use of the area by big game animals will be limited because sufficient browse plants are not available.

In 1983, hunting leases were worth about 8 times the value of grazing leases on an acre basis. Livestock and deer compete for many of the same browse plants in woodlands. Livestock management is necessary to minimize the reduction in carrying capacity of the woodlands for deer. Many landowners are removing livestock from their woodlands in favor of deer herds.

The quantity and quality of understory vegetation also vary with the kind of soil, the age and kind of trees in the canopy, and the depth of the litter on the forest floor.

Table 7 lists the major plants (grasses, forbs, shrubs, and understory reproduction) that may be present under the canopy density that represents the highest wood production for the forest crop of the particular woodland ordination group. The understory vegetation includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4.5 feet. The annual production is expressed in pounds per acre of air-dry vegetation expected in normal years receiving average soil moisture during the growing season.

Table 7 also lists the vegetation common to the woodland ordination group by percent composition (air-dry weight) for each plant. It shows the kind and percentage of understory plants that may occur in the climax plant community where burning has occurred every 3 or 4 years and where the canopy is 35 to 55 percent pine. Generally, most understory plant communities contain in excess of 65 percent pinehill bluestem grass. Other plants make up the remainder of the plant community in about the percentages shown.

Adaptation of the plants to the woodland ordination group is also reflected in table 7. For example, wax myrtle is adapted to ordination groups that have any degree of wetness, such as group 10W, and is not adapted to the dry sandy groups, such as group 8S.

In addition to proper woodland management, the following practices can help achieve high levels of forage production consistent with good forest management.

Proper woodland grazing or *proper grazing use* is grazing at an intensity that maintains or improves the

quantity and quality of desirable plants. This is generally thought to be grazing of no more than one-half, by weight, or the annual growth of key forage plants in preferred grazing areas. Proper grazing increases vigor and reproduction of key forage plants, conserves soil and water, improves the condition of the vegetation, increases forage production, maintains natural beauty, and reduces the hazard of wildfire.

Deferred grazing consists of postponing grazing or resting the site from grazing for a prescribed period. This rest period promotes the growth of natural vegetation by increasing the vigor of forage and permitting desirable plants to seed. Deferred grazing provides feed reserves for fall and winter grazing, improves the appearance of lands that have adequate cover, improves hydrologic conditions, and reduces soil loss.

Planned grazing systems are systems in which two or more grazing units are rested from grazing in a planned sequence throughout the year or during the growing season of key forage plants. This is advantageous for the production of desirable forage plants and for trees.

Prescribed burning involves the use of controlled fire. This can be used to control undesirable vegetation, increase production through removal of part of the duff, reduce the hazard of wildfires. and remove old, unpalatable, rough growth.

Recreation

In table 8, the soils of the survey area are rated according to the limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes, stones, or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Frank Sprague, biologist, Soil Conservation Service, helped prepare this section.

Angelina County is a rural environment dominated by stands of pines and mixed hardwoods on uplands and stands of hardwoods adjacent to rivers and streams on bottom lands.

Habitat for the many species of wildlife is provided by a diverse mixture of trees, shrubs, and herbaceous plants. Interspersed within the woodlands are openings

that have been cleared and established to pastureland or planted to crops.

The major game species are white-tailed deer, fox and gray squirrels, turkey, bobwhite quail, and mourning dove. Important furbearers are raccoons, mink, fox, opossum, and skunk. Waterfowl are common on ponds, streams, and flooded bottom lands during the fall and winter. Numerous nongame birds and animals are associated with various habitat types. The edge effect provided by harvested timber is valuable to nongame wildlife and to quail and rabbit.

Formerly, black bear and red wolf lived in the county, but none have been seen in recent years. Two endangered species, the bald eagle and red-cockaded woodpecker, are in the county.

Because of increased landowner interest in habitat management and protection, white-tailed deer populations have increased during the past few years. Populations average about 1 deer to 75 acres, but they are higher in many areas. An increase in leasing by hunting clubs provides an economic incentive for management. The lack of reliable year-round food supplies limits the number of deer that can be supported by many tracts of land, particularly tracts where pine production is the dominant land use.

Squirrel populations are high and are associated primarily with hardwood trees along rivers and streams. Populations fluctuate according to food supplies. Destruction of hardwoods is the greatest threat to squirrels.

The eastern turkey has been reestablished in east Texas. The number is increasing where the turkey is protected and where habitat needs are met.

Quail habitat requirements are provided in clearcuts, weedy pastures, and small cropland fields. Disking to promote forb growth is beneficial for quail.

Timber management practices that include wildlife considerations offer the best opportunities for improving wildlife habitat. Increased application of prescribed burning benefit deer and other species.

Soils on uplands are well adapted to a variety of plants useful to wildlife. Corn, oats, peas, and other food and forage plants are grown. Soils on bottom lands are generally favorable for the construction of dikes for green tree reservoirs or other wetland development.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, and oats.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, clover, and vetch.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, tickclover, and switchgrass.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, cherry, sweetgum, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit- and forage-producing shrubs that are suitable on

soils rated *good* are Russian-olive, autumn-olive, wild plum, American beautyberry, yaupon, sumac, and buttonbush.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial, wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, cattails, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, cottontail, and gray fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, mink, and beaver.

Engineering

Henry Keller, civil engineer, Soil Conservation Service, helped prepare this section.

Soils information in Angelina County can benefit planning commissions, town and city managers, land developers, engineers, contractors, and farmers and ranchers.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet, and because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations must be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to: evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost-action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and that good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath

the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the

water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and releases a variety of plant-available nutrients as it decomposes.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives the restrictive features that affect each soil for drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium.

A high water table affects the amount of usable material. It also affects trafficability. Piping is a problem on many construction sites in Angelina County. It occurs when earthen structural measures are installed on such soils as the Darco, Diboll, Fuller, Keltys, and Mollville soils.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 19.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20, or higher, for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 19.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area, or from nearby areas, and on field examination.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They influence the soil's absorption of cations, moisture retention, shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage in each major soil layer is stated in inches of water per inch of soil. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4

percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflowing streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as *none, rare, occasional,* or *frequent. None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (there is a near 0 to 5 percent chance of flooding in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (there is a 5 to 50 percent chance of flooding in any year). *Frequent* means that flooding occurs often under normal weather conditions (there is more than a 50 percent chance of flooding in any year). *common* is used when classification as occasional or frequent does not affect interpretations. Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of year that floods are most likely to occur is expressed in months. November-May, for example, means that flooding can occur during the period November through May. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely, thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons, which are characteristic of soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table; that is, *perched, artesian*, or *apparent;* and the months of the year that the water table commonly is highest. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An *artesian* water table is under hydrostatic head, generally

below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

The two numbers in the "High water table-Depth" column indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that the water table exists for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severely corrosive environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer. The risk of corrosion is high on many soils in Angelina County including the Diboll, Herty, Keltys, Koury, Mollville, Rosenwall, and Woodtell soils.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and the amount of sulfates in the saturation extract.

Physical and Chemical Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 17 and the results of chemical analysis in table 18. The data are for soils sampled at carefully selected sites. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." Soil samples were analyzed by the National Soil Survey Laboratory or by the Soil Characterization Laboratory at Texas A&M University.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an oven-dry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods *(23)*.

Sand—(0.05-2.0 mm fraction) weight percentages of materials less than 2 mm (3A1).
Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all materials less than 2 mm (3A1).
Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of materials less than 2 mm (3A1).
Water retained—pressure extraction, percentage of oven-dry weight of less than 2 mm material; 1/3 or 1/10 (3/10) bar (4B1), 15 bars (4B2).
Extractable cations—ammonium acetate pH 7.0, uncorrected; calcium (6N2), magnesium (602), sodium (6P2), potassium (6Q2).
Extractable acidity—barium chloride-triethanolamine II (6H2a).
Base saturation—ammonium acetate, pH 7.0 (5C1).
Base saturation—sum of cations, TEA, pH 8.2 (5C3).
Reaction (pH)—1:1 water dilution (8C1a).
Reaction (pH)—calcium chloride (8C1e).
Aluminum—potassium chloride extraction (6G).
Electrical conductivity—saturation extract (8A1a).
Sodium-adsorption ratio (5E).

Engineering Index Test Data

Table 19 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." The soil samples were tested by Texas State Department of Highways and Public Transporation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Specific gravity (particle density)—T100 (AASHTO), D653 (ASTM); Shrinkage—T 92 (AASHTO), D 427 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(22)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or on laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders, primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udult (*Ud*, meaning moist, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludults (*Hapl*, meaning minimal horizonation, plus *udults*, the suborder of the Ultisols that occur in moist climates).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, siliceous, thermic Typic Hapludults. Stringtown soils are in this family.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. There can be some variation in the texture of the surface layer or of the substratum within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual (20)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (22)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Alazan Series

The Alazan series consists of deep somewhat poorly drained soils that formed in loamy sediment partly reworked by the wind. Permeability is moderate. These nearly level to gently sloping soils are on terraces and low uplands. Slopes range from 0 to 4 percent. These soils have a water table 18 to 30 inches below the surface late in winter and early in spring.

Soils of the Alazan series are fine-loamy, siliceous, thermic Aquic Glossudalfs.

Typical pedon of Alazan very fine sandy loam, 0 to 4 percent slopes; about 8 miles southeast of Huntington at

the intersection of Farm Road 3124 and Farm Road 2109, 0.45 mile east on Farm Road 3124, 180 feet north, in timber. This pedon is on map sheet 31.

A1—0 to 4 inches; dark gray (10YR 4/1) very fine sandy loam; weak medium granular structure; soft, very friable; many fine and medium roots; strongly acid; clear smooth boundary.

A2—4 to 9 inches; mottled brown (10YR 5/3) and dark gray (10YR 4/1) very fine sandy loam; weak medium granular structure; soft, very friable; many fine and medium roots; very strongly acid; gradual wavy boundary.

E—9 to 16 inches; pale brown (10YR 6/3) very fine sandy loam; common medium faint light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/6) mottles; massive but porous; slightly hard, friable; common medium and coarse roots; very strongly acid; gradual wavy boundary.

Bt/E1—16 to 37 inches; yellowish brown (10YR 5/6) loam; common medium distinct light brownish gray (10YR 6/2) mottles; about 40 percent tongues of light brownish gray (10YR 6/2); weak medium subangular blocky structure; slightly hard, friable; common medium and fine roots; common fine and medium pores; strongly acid; gradual wavy boundary.

Bt/E2—37 to 58 inches; mottled strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) loam; tongues of light gray (10YR 7/2); moderate medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable; about 10 percent of the Bt material is brittle; few clay films; strongly acid; gradual wavy boundary.

Bt—58 to 72 inches; mottled yellowish red (5YR 5/8), strong brown (7.5YR 5/6), and light brownish gray (10YR 6/2) sandy clay loam; weak medium subangular blocky structure; hard, firm; few clay films; medium acid.

The thickness of the solum ranges from 60 to more than 80 inches.

The combined thickness of the A and E horizons ranges from 8 to 22 inches. The A horizon is brown, grayish brown, dark grayish brown, or dark gray. Reaction ranges from very strongly acid to medium acid. The E horizon is light brownish gray, light gray, pale brown, or very pale brown. Some pedons have yellowish brown, brownish yellow, or strong brown mottles or stains. The reaction of the E horizon is very strongly acid or strongly acid.

The Bt/E horizon is loam or sandy clay loam. To a depth of 20 inches, clay content is 18 to 25 percent and silt content is 28 to 45 percent. Reaction in the upper part of the horizon is very strongly acid or strongly acid. Reaction in the lower part ranges from strongly acid to slightly acid. The Bt part of the Bt/E horizon has matrix colors of yellowish brown, brownish yellow, strong brown, and reddish yellow. Some pedons have yellowish red or red mottles. The E material is gray, light gray, light brownish gray, or pale brown. Up to 25 percent of some pedons is brittle.

The Bt horizon has a mottled matrix. Bright colors are yellowish brown, strong brown, or yellowish red. Pale colors are light gray or light brownish gray. Reaction ranges from strongly acid to neutral.

Some pedons have a C horizon that is within a depth of 80 inches. Texture ranges from loamy fine sand to sandy clay loam.

Attoyac Series

The Attoyac series consists of deep, loamy, well drained soils. Permeability is moderate. These soils formed in sediment partly reworked by the wind and deposited as terraces of the Angelina and Neches Rivers. Slopes range from 0 to 15 percent.

Soils of the Attoyac series are fine-loamy, siliceous, thermic Typic Paleudalfs.

Typical pedon of Attoyac fine sandy loam, 0 to 4 percent slopes; about 10 miles east of Huntington on the Angelina River terrace, about 1 mile north of Hanks Creek on Farm Road 2109, 800 yards north on Ora Church Road, and 100 feet in a pasture. This pedon is on map sheet 25.

A1—0 to 5 inches; dark brown (10YR 4/3) fine sandy loam; weak medium granular structure; soft, very friable; common fine roots and pores; medium acid; clear smooth boundary.

A2—5 to 11 inches; dark brown (7.5YR 4/4) fine sandy loam; weak medium subangular blocky structure; soft, very friable; common fine roots and pores; slightly acid; gradual smooth boundary.

Bt1—11 to 48 inches; dark red (2.5YR 3/6) sandy clay loam; weak medium subangular blocky structure; soft, friable; common fine roots and pores; few thin patchy clay films; strongly acid; gradual wavy boundary.

Bt2—48 to 72 inches; red (2.5YR 4/8) sandy clay loam; weak medium subangular blocky structure; slightly hard, friable; common fine roots and pores; common thin clay films; few pale brown (10YR 6/3) ped coatings; strongly acid.

The thickness of the solum ranges from 60 to more than 100 inches.

The A horizon is reddish brown, yellowish red, brown, dark brown, strong brown, or yellowish brown, and is less than 20 inches thick. Where moist value is less than 3.5 and chroma is 3 or less, the A horizon is less than 6 inches thick. Reaction ranges from strongly acid to slightly acid.

The upper part of the Bt horizon is dark red, red, or yellowish red. It is sandy clay loam, loam, or fine sandy loam. The average clay content ranges from 18 to 32 percent, and silt content exceeds 20 percent. The lower part of the Bt horizon is red, dark red, yellowish red, or strong brown. It is sandy clay loam or loam. Reaction ranges from strongly acid to slightly acid, and base saturation ranges from 35 to 60 percent throughout the Bt horizon. Few skeletans and small pockets of uncoated sand and silt are in some pedons but make up less than 5 percent of the mass.

Bernaldo Series

The Bernaldo series consists of deep, loamy, well drained soils on very old terraces. Permeability is moderate. These soils formed in sediment on the Neches and Angelina River terraces and have been partly reworked by the wind. Slopes range from 0 to 3 percent.

Soils of the Bernaldo series are fine-loamy, siliceous, thermic Glossic Paleudalfs.

Typical pedon of Bernaldo fine sandy loam, 0 to 3 percent slopes; in extreme southern Angelina County, about 200 yards north of the Jasper County line, 300 yards west of U.S. Highway 69. This pedon is on map sheet 48.

A—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam; weak fine granular structure; soft, very friable; common fine roots; slightly acid; clear smooth boundary.

E1—8 to 12 inches; brown (10YR 5/3) fine sandy loam; weak fine granular structure; soft, very friable; common fine roots; strongly acid; gradual smooth boundary.

E2—12 to 17 inches; pale brown (10YR 6/3) fine sandy loam; massive; soft, very friable; common fine roots; slightly acid; clear wavy boundary.

Bt—17 to 50 inches; strong brown (7.5YR 5/8) loam; weak medium subangular blocky structure; slightly hard, friable; few fine roots; common fine and very fine pores; thin discontinuous clay films; sand grains coated and bridged; few dark concretions and soft masses; strongly acid; gradual wavy boundary.

Bt/E—50 to 65 inches; yellowish brown (10YR 5/6) loam; common medium distinct yellowish red (5YR 5/8) mottles; weak coarse prismatic structure parting to weak fine subangular blocky; hard, friable; few fine roots; few fine and very fine pores; few discontinuous clay films; about 5 percent brittle mass; about 10 percent light brownish gray (10YR 6/2) vertical ped coatings; strongly acid.

The thickness of the solum ranges from 60 to more than 100 inches. Depth to saturated horizons ranges from 48 to 72 inches during the cool season in most years.

The combined thickness of the A and E horizons ranges from 8 to 20 inches. Reaction ranges from strongly acid to slightly acid. The A or Ap horizon is dark brown, very dark grayish brown, dark yellowish brown, dark grayish brown, brown, pale brown, or grayish brown. The E horizon is brown, pale brown, or very pale brown.

The Bt horizon is reddish brown, light reddish brown, brown, strong brown, light brown, yellowish brown, light yellowish brown, brownish yellow, or yellow. Mottles in shades of brown, gray, and red are in most pedons. Mottles that have chroma of 2 or less are below a depth of 30 inches. Texture is loam or sandy clay loam. Clay content in the upper 20 inches ranges from 18 to 30 percent; silt content ranges from 20 to about 45 percent. Reaction ranges from very strongly acid to slightly acid.

The Bt/E horizon is loam or sandy clay loam. The Bt part of the Bt/E horizon has the same range in color as the Bt horizon. The E part of the Bt/E horizon consists of ped coatings and vertical streaks that are 1 to 5 cm wide and 5 to 30 cm long. This E material is light gray, pale brown, or light brownish gray. It makes up from 5 to 15 percent of the matrix. Reaction of the Bt/E horizon ranges from very strongly acid to slightly acid.

Besner Series

The Besner series consists of deep, loamy, well drained soils on mounds on stream terraces. Permeability is moderate. These soils formed in sediment partly reworked by the wind. Slopes range from 0 to 3 percent.

Soils of the Besner series are coarse-loamy, siliceous, thermic Glossic Paleudalfs.

Typical pedon of Besner fine sandy loam, in an area of Bernaldo-Besner complex, gently undulating; in timber, about 500 feet north of the intersection of Texas Highway 103 and Texas Highway 7. This pedon is on map sheet 4.

A—0 to 8 inches; dark brown (10YR 4/3) fine sandy loam; weak medium granular structure; soft, loose; many roots of all sizes; medium acid; abrupt wavy boundary.

E1—8 to 18 inches; brown (10YR 5/3) fine sandy loam: weak fine granular structure; slightly hard, loose; common medium and coarse roots; strongly acid; clear wavy boundary.

E2—18 to 26 inches; pale brown (10YR 6/3) fine sandy loam; weak fine granular structure; slightly hard, loose; common medium and coarse roots; strongly acid; gradual wavy boundary.

Bt—26 to 42 inches; yellowish brown (10YR 5/8) loam; moderate medium subangular blocky structure; slightly hard, friable; common fine roots; common fine pores; sand grains coated and bridged with clay; strongly acid; clear wavy boundary.

Bt/E1—42 to 65 inches; yellowish brown (10YR 5/8) loam; few ped coatings of pale brown (10YR 6/3); weak medium subangular blocky structure; slightly hard, friable; few fine roots; common fine pores; sand grains coated and bridged with clay; about 10 percent of the matrix is brittle and has high chroma; strongly acid; clear wavy boundary.

Bt/E2—65 to 80 inches; strong brown (7.5YR 5/8) loam; about 15 to 20 percent interfingering of light gray (10YR 6/1) fine sandy loam; weak subangular blocky structure; slightly hard, friable; about 15 percent of the matrix is brittle and has high chroma; strongly acid.

The thickness of the solum ranges from 70 to more than 80 inches. The clay content in the upper 20 inches of the argillic horizon ranges from 14 to 18 percent, and the silt content ranges from 20 to 45 percent. Reaction ranges from very strongly acid to slightly acid throughout the profile.

The combined thickness of the A and E horizons is 20 to 40 inches. The A horizon is dark grayish brown, grayish brown, brown, or dark brown. The E horizon is brown, very pale brown, pale brown, light gray, or light yellowish brown.

The Bt horizon is yellowish brown, brownish yellow, light yellowish brown, strong brown, or reddish yellow. The texture is fine sandy loam or loam.

The Bt/E horizon has matrix colors similar to those of the Bt horizon, and also light yellowish brown or olive yellow. The Bt part has red and yellowish red mottles. The E part is light gray, pale brown, or very pale brown. About 2 to 20 percent of the Bt/E horizon is brittle.

Bienville Series

The Bienville series consists of deep, somewhat excessively drained, sandy soils on terraces. Permeability is moderately rapid. These soils are essentially sand deposits from old stream meanders. Slopes range from 0 to 5 percent.

Soils of the Bienville series are sandy, siliceous, thermic Psammentic Paleudalfs.

Typical pedon of Bienville loamy fine sand, 0 to 5 percent slopes; in northwest Angelina County near the intersection of Texas Highway 103 and Texas Highway 7 near the Neches River, 100 feet south of cemetery, and 75 feet east of road, in a pasture. This pedon is on map sheet 9.

Ap—0 to 7 inches; dark brown (10YR 4/3) loamy fine sand; weak medium granular structure; soft, loose; many fine roots; medium acid; gradual smooth boundary.

A—7 to 20 inches; yellowish brown (10YR 5/4) loamy fine sand; single grained; soft, loose; many fine roots; strongly acid; gradual smooth boundary.

Bt/E1—20 to 50 inches; strong brown (7.5YR 5/6) loamy fine sand (Bt), splotches of pale brown (10YR 6/3) loamy fine sand (E), and lamellae of yellowish red (5YR 5/6) loamy fine sand (Bt); single grained; soft, loose; common fine roots; clay bridging; strongly acid; gradual wavy boundary.

Bt/E2—50 to 80 inches; strong brown (7.5YR 5/6) loamy fine sand (Bt), many coarse prominent striped areas of very pale brown (10YR 7/3) loamy fine sand (E), and common splotches and lamellae of yellowish red (5YR 4/6) loamy fine sand (Bt); soft, loose; common fine roots; medium acid.

The thickness of the solum is more than 60 inches.

The Ap horizon or the upper part of the A horizon is dark grayish brown, brown, dark brown, or grayish brown. The lower part of the A horizon is brown, pale brown, yellowish brown, or light yellowish brown. The A horizon is 18 to 40 inches thick. Reaction ranges from strongly acid to slightly acid.

The Bt part of the Bt/E horizon is strong brown, reddish brown, or yellowish red. The E part of the Bt/E horizon is brown, pale brown, light yellowish brown, or very pale brown. It makes up 15 to 40 percent of the Bt/E horizon. In some pedons, a Bt horizon is in place of a Bt/E horizon. The Bt horizon or the Bt part of the Bt/E horizon is typically loamy fine sand, especially in the upper 20 inches, but it ranges to fine sandy loam below a depth of 20 inches. Reaction ranges from medium acid to very strongly acid.

Browndell Series

The Browndell series consists of shallow, loamy, somewhat poorly drained soils. Permeability is very slow. These soils formed in acid tuffaceous siltstone in or near the Catahoula Formation. Slopes range from 2 to 15 percent.

Soils of the Browndell series are clayey, montmorillonitic, thermic, shallow Albaquic Hapludalfs.

Typical pedon of Browndell fine sandy loam, 2 to 5 percent slopes; about 1.8 miles east of U.S. Highway 69 near the county line road between Angelina and Jasper Counties, 300 feet north, and 180 feet east. This pedon is on map sheet 48.

A—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; soft, friable; many fine roots; few cobbles and stones; medium acid; clear wavy boundary.

E—5 to 9 inches; light brownish gray (10YR 6/2) fine sandy loam; massive but porous; slightly hard, friable; many medium and fine roots; few stones; strongly acid; abrupt wavy boundary.

Bt—9 to 16 inches; grayish brown (2.5Y 5/2) clay; few particles of weakly consolidated volcanic tuff in the lower part; common fine faint pale olive mottles;

moderate medium subangular blocky structure; very firm, very hard, very plastic and sticky; few roots; few clay films; strongly acid; clear smooth boundary.

Cr—16 to 30 inches; pale olive (5Y 6/3) weakly consolidated tuffaceous mudstone; olive (5Y 5/6) and strong brown (7.5YR 5/6) coatings on faces of angular blocks along fractures; massive; hard, hardness less than 3 on Mohs scale; very strongly acid.

The thickness of the solum and depth to paralithic tuffaceous siltstone is 14 to 20 inches. Cobbles and stones from 3 to 15 inches or more in diameter are on the surface of most pedons and cover as much as 15 percent of the surface.

The A horizon is dark gray, dark grayish brown, very dark gray, or very dark grayish brown. Gravel-size fragments make up as much as 10 percent of the A horizon of some pedons. The A horizon is 2 to 9 inches thick. Reaction ranges from very strongly acid to slightly acid.

The E horizon is grayish brown, light gray, or light brownish gray and ranges from 0 to 5 inches thick. The boundary between the E horizon and Bt horizon is clear or abrupt, smooth or wavy, and the texture changes abruptly.

The Bt horizon is grayish brown, light brownish gray, light olive gray, pale olive, or grayish brown. Pale brown or pale olive mottles in the upper part of the horizon and brown and light brownish gray mottles in the lower part are few or common. The grayish matrix colors could be inherited from the underlying material. The Bt horizon is clay or silty clay. The clay content ranges from 40 to 60 percent. Gravel-size fragments in some pedons make up as much as 15 percent of the volume. Reaction ranges from very strongly acid to medium acid.

The Cr horizon is pale olive, light olive gray, light gray, gray, or light brownish gray weakly consolidated tuffaceous sandstone and siltstone. It is bentonitic but contains volcanic ash, volcanic glass, and other pyroclastic material. Reaction ranges from extremely acid to slightly acid.

Corrigan Series

The Corrigan series consists of moderately deep, loamy, somewhat poorly drained soils on uplands. Permeability is very slow. These soils formed in acid tuffaceous material mainly in the Catahoula Formation. Slopes range from 1 to 5 percent.

Soils of the Corrigan series are fine, montmorillonitic, thermic Typic Albaqualfs.

Typical pedon of Corrigan fine sandy loam, 1 to 5 percent slopes; about 4 miles west of Texas Highway 63 at Cyclone Hill on a county road, 1.3 miles south on and 50 feet west of U.S. Forest Service road. This pedon is on map sheet 44.

A—0 to 5 inches; dark gray (10YR 4/1) fine sandy loam; weak medium granular structure; soft, very friable; many fine roots; strongly acid; clear smooth boundary.

E—5 to 6 inches; grayish brown (10YR 5/2) fine sandy loam; massive but porous; hard, friable; common fine and medium roots; strongly acid; abrupt wavy boundary.

Bt1—6 to 10 inches; mottled grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) clay; few fine prominent reddish yellow (5YR 5/6) mottles; moderate medium subangular blocky structure; very hard, very firm, very plastic and sticky; common fine roots; few clay films; few pressure faces; strongly acid; gradual wavy boundary.

Bt2—10 to 33 inches; grayish brown (2.5Y 5/2) clay; few fine distinct light olive gray (5Y 6/2) mottles; weak medium subangular blocky structure; very hard, very firm; very plastic and sticky; few fine roots; few clay films; few pressure faces; strongly acid; clear smooth boundary.

Bt3—33 to 39 inches; light olive gray (5Y 6/2) clay; few spots of light gray (5Y 7/2) partly weathered mudstone; weak fine subangular blocky structure; very hard, very firm; very plastic and sticky; strongly acid; gradual smooth boundary.

Cr—39 to 60 inches; olive gray (5Y 5/2) and pale olive (5Y 6/3) tuffaceous siltstone.

The thickness of the solum and depth to paralithic contact range from 20 to 40 inches.

The A horizon is very dark brown, very dark gray, very dark grayish brown, dark gray, or dark grayish brown. The E horizon is dark grayish brown, grayish brown, or light brownish gray. The combined thickness of the A and E horizons ranges from 3 to 14 inches. Reaction ranges from very strongly acid to medium acid.

The Bt1 and Bt2 horizons are dark grayish brown, grayish brown, light brownish gray, or olive gray. The Bt3 horizon has the same range of colors but also includes olive and pale olive. Few or common mottles are in shades of red and brown in the Bt1 and Bt2 horizons and gray and olive in the Bt3 horizon. Clay content in the upper 20 inches of the Bt horizon averages between 40 and 60 percent, but may be as much as 70 percent. The Bt3 horizon is clay or silty clay. Reaction ranges from extremely acid to strongly acid in the Bt horizon.

The Cr horizon is weakly consolidated tuffaceous sandstone that is bentonitic but contains volcanic ash, volcanic glass, and other pyroclastic material. Reaction ranges from medium acid to extremely acid.

Cuthbert Series

The Cuthbert series consists of deep, loamy, well drained soils on uplands. Permeability is moderately

slow. These soils formed in acid, stratified loamy and clayey material. Slopes range from 5 to 35 percent.

Soils of the Cuthbert series are clayey, mixed, thermic Typic Hapludults.

Typical pedon of Cuthbert fine sandy loam, 5 to 15 percent slopes; in timber, about 2.1 miles east on River Crest Road from intersection with U.S. Highway 459, 0.7 mile south along railroad from intersection with River Crest Road, and 20 feet west. This pedon is on map sheet 7.

A—0 to 5 inches; dark brown (10YR 4/3) fine sandy loam; weak medium granular structure; soft, very friable; about 5 percent, by volume, gravels; strongly acid; clear wavy boundary.

E—5 to 9 inches; pale brown (10YR 6/3) fine sandy loam; massive; slightly hard, friable; about 5 percent, by volume, gravels; strongly acid; clear wavy boundary.

Bt1—9 to 18 inches; red (2.5YR 5/8) clay; strong medium blocky structure; hard, firm; continuous clay films on surfaces of peds; about 2 percent, by volume, gravels; strongly acid; gradual smooth boundary.

Bt2—18 to 33 inches; yellowish red (5YR 5/8) clay loam; weak medium blocky structure; hard, firm; continuous thin clay films on surfaces of peds; strongly acid; gradual smooth boundary.

B/C—33 to 37 inches; partly weathered horizontal layers of yellowish red (5YR 5/8) soft sandstone and light brownish gray (10YR 6/2) bits of shale; weak coarse blocky structure; hard, friable; thick red continuous clay films on peds; extremely acid, clear smooth boundary.

C—37 to 60 inches; stratified yellowish red (5YR 5/8) soft sandstone and grayish brown (10YR 5/2) shale; strata are 0.25 inch to 4.0 inches thick; sandy material is weakly cemented but can be easily cut with a spade; common fine flakes of mica mainly on surfaces of shale strata; strongly acid.

The thickness of the solum ranges from 20 to 40 inches. Base saturation ranges from 20 to 30 percent. Clay content of the control section ranges from 40 to 60 percent, and silt content ranges from 15 to 30 percent.

The A horizon is dark brown, brown, very dark gray, dark grayish brown, or grayish brown. Thickness ranges from 3 to 8 inches. Texture is fine sandy loam or gravelly fine sandy loam. Ironstone gravels make up from 1 percent to about 35 percent, by volume, of this horizon. Reaction ranges from very strongly acid to slightly acid.

The E horizon is brown, light brown, pale brown, yellowish brown, or light yellowish brown. Thickness ranges from 0 to 11 inches. Reaction ranges from very strongly acid to medium acid.

The Bt horizon is dark reddish brown, reddish brown, dark red, red, or yellowish red. Light brownish gray, pale brown, and strong brown mottles are in the lower part of many pedons. The gray color is caused by shale fragments. The Bt horizon generally is 1 to 10 percent, by volume, pebbles of angular and flat ironstone. Reaction ranges from extremely acid to strongly acid.

The C horizon is interbedded or stratified, soft sandstone, sandy loam, sandy clay loam and shale. In most pedons, the sandy material is weakly cemented but can be cut with a spade and penetrated by roots. Flakes of mica are visible along cleavage planes between strata as well as in the sandy material of many pedons. Reaction ranges from extremely acid to strongly acid.

Darco Series

The Darco series consists of deep, sandy, somewhat excessively drained soils on uplands. Permeability is moderate. These soils formed in sandy sediment. Slopes range from 1 to 15 percent.

Soils of the Darco series are loamy, siliceous, thermic Grossarenic Paleudults.

Typical pedon of Darco loamy fine sand, 1 to 8 percent slopes; inside Loop 287 and 0.3 mile north of Kurth Drive. This pedon is on map sheet 11.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) loamy fine sand; weak granular structure; soft, loose; many fine and medium tree roots; medium acid; gradual smooth boundary.

E1—6 to 38 inches; yellowish brown (10YR 5/4) loamy fine sand; single grained; soft, very friable; common fine roots; medium acid; gradual smooth boundary.

E2—38 to 55 inches; light yellowish brown (10YR 6/4) loamy fine sand; single grained; soft, very friable; few fine roots; medium acid; gradual smooth boundary.

Bt—55 to 69 inches; red (2.5YR 5/6) sandy clay loam; weak fine subangular blocky structure; slightly hard, friable; few fine pores; thick patchy clay films; strongly acid; gradual smooth boundary.

Bt/C—69 to 80 inches; red (2.5YR 4/6) sandy clay loam; few light brownish gray (10YR 6/2) shale spots surrounded by dark red clay films or clay flows, in red (2.5YR 4/8) weakly consolidated sandstone; strongly acid.

The thickness of the solum exceeds 80 inches.

Combined thickness of the A and E horizons ranges from 40 to 72 inches. The A horizon is very dark grayish brown, dark grayish brown, dark brown, or brown. Reaction ranges from strongly acid to slightly acid. The E horizon is brown, pale brown, light yellowish brown, or yellowish brown. Reaction ranges from very strongly acid to slightly acid.

The Bt horizon is red, yellowish red, strong brown, or yellowish brown. Brownish and reddish mottles range from none to common. Mottles that have chroma of 2 are below a depth of 50 inches in the Bt horizon in some

pedons. The Bt horizon is sandy loam or sandy clay loam. Clay content is 15 to 25 percent. Reaction is very strongly acid or strongly acid. Plinthite content in the Bt horizon ranges from 0 to about 5 percent.

Diboll Series

The Diboll series consists of deep, somewhat poorly drained soils on slightly concave uplands. Permeability is very slow. These nearly level or gently sloping soils formed in loamy sediment deposited over siltstone mainly in the Caddell and Manning Formations. A perched water table is 6 to 18 inches below the surface late in winter and early in spring. Slopes range from 0 to 4 percent.

Soils of the Diboll series are fine-silty, siliceous, thermic Albic Glossic Natraqualfs.

Typical pedon of Diboll very fine sandy loam, 1 to 4 percent slopes; about 25 miles southeast of Lufkin, 5 miles east of Zavalla on Texas Highway 147, 0.3 mile south on logging road, and 75 feet south, in the national forest. This pedon is on map sheet 31.

A—0 to 9 inches; grayish brown (10YR 5/2) very fine sandy loam; weak medium granular structure; soft, friable; many fine, medium, and coarse roots; very strongly acid; clear smooth boundary.

E1—9 to 17 inches; light brownish gray (10YR 6/2) very fine sandy loam; many medium distinct strong brown (7.5YR 5/8) mottles and stains along root channels; massive but porous; soft, friable; common medium and fine roots; very strongly acid; gradual wavy boundary.

E2—17 to 29 inches; light brownish gray (10YR 6/2) very fine sandy loam; common medium distinct strong brown (7.5YR 5/8) mottles and stains along root channels; massive but porous; slightly hard, friable, slightly sticky and nonplastic; common fine and medium roots; common rounded crayfish burrows filled with light gray (10YR 7/2) silt loam that has thin (less than 1 cm thick) cups of dark gray (10YR 4/1) silty clay material that has a slick soapy consistency; strongly acid; clear irregular boundary.

Btn/E—29 to 36 inches; mottled light brownish gray (2.5Y 6/2) and light yellowish brown (2.5Y 6/4) clay loam; dark grayish brown (10YR 4/2) clayey material about 6 mm thick surrounds most peds, about 40 percent tongues of light gray (10YR 7/2) loam (E) between peds; moderate medium columnar structure parting to weak medium angular blocky; hard, friable, sticky and plastic; few fine roots mainly in E material; common rounded crayfish burrows filled with E material and having cups of dark gray (10YR 4/1) clayey material at bottom of burrows; about 40 percent Bt material that has a slick soapy consistency; about 20 percent of the matrix ped interiors is siltstone that breaks conchoidal; electricity conductivity 1.8 mmho/cm; slightly acid; clear irregular boundary.

2Cr/Btn—36 to 43 inches; light olive brown (2.5YR 5/4) siltstone; spots of light brownish gray (2.5Y 6/2) and strong brown (7.5YR 5/6); siltstone has conchoidal fractures; coatings about 2 mm thick of dark gray (10YR 4/1) silty clay loam (Bt) and interfingers 2 to 5 mm thick of light gray (10YR 7/2) silt loam (E) in cracks and crevices of fracture planes; very hard, very firm; few fine roots along cracks; few crayfish burrows filled with light gray (10YR 7/2) and dark gray (10YR 4/1) clay cups; burrows lined with grayish brown (10YR 5/2) silty clay loam; Bt part has slick soapy consistency; thin black coatings (iron-manganese) on some horizontal faces; few masses of powdery barite; electricity conductivity 2.3 mmho/cm; neutral; gradual wavy boundary.

3Cr1—43 to 55 inches; pale olive (5Y 6/3) siltstone; few crayfish burrows lined with grayish brown (10YR 5/2) and filled with light gray (10YR 7/2) silt loam; few masses of powdery barite; thin black coating (iron-manganese) on many rock faces; thin layer of natrojarosite and jarosite in shades of red to shades of yellow on few faces; few flat roots on rock faces; electricity conductivity 2.8 mmho/cm; neutral; gradual wavy boundary.

3Cr2—55 to 67 inches; pale olive (5Y 6/3) siltstone; thin black coatings (iron-manganese) on most rock faces; few masses of powdery barite; reddish to yellowish coating of jarosite and natrojarosite in shades of red to shades of yellow on some faces; few spots of calcite and gypsum; few fine flat roots in upper part on rock faces; electricity conductivity 2.3 mmho/cm; neutral.

The thickness of the solum ranges from 30 to 50 inches. Depth to a paralithic contact ranges from 40 to 60 inches. Pebbles at the contact of the 2Cr/Btn horizon range from none to common.

The combined thickness of the A and E horizons ranges from 25 to 45 inches. Aluminum saturation of the A horizon and upper part of the E horizon ranges from 20 to 65 percent.

The A horizon is dark grayish brown or grayish brown. Reaction ranges from very strongly acid to slightly acid except where lime has been added.

The E horizon is light gray, gray, light brownish gray, or grayish brown. Texture is very fine sandy loam or loam. Stains along roots are in shades of red and brown. Reaction ranges from very strongly acid to slightly acid. Exchangeable sodium in the lower part of the E horizon ranges from 2 to 10 percent.

The Btn/E and 2Cr/Btn horizons are variegated with ped interiors of siltstone parent material that is little weathered, is surrounded by darker and grayish argillic material, and has sandy E material between peds. This gives a color pattern of yellowish or olive interiors, dark

gray rinds, and grayish filling between. The Btn part consists of streaks and masses of silty clay loam, loam, or clay loam. The E part consists of tongues, filled crayfish holes, and streaks of very fine sandy loam or loam that is light gray or light brownish gray. Mottles in shades of brown or yellow range from none to common and are mainly in interior of peds. Reaction ranges from strongly acid to neutral. Average clay content of the horizon is 18 to 35 percent, and the silt content ranges from 30 to 55 percent. Electrical conductivity is less than 4 mmhos/cm. Exchangeable sodium ranges from 18 to 30 percent.

The 3Cr horizon is clayey siltstone that naturally contains many salts, such as barite, gypsum, calcite, jarosite, and natrojarosite. Colors are olive or pale olive to grayish brown. Exchangeable sodium ranges from 20 to 30 percent.

Etoile Series

The Etoile series consists of deep, loamy, somewhat poorly drained soils on uplands. Permeability is very slow. These soils formed in calcareous, clayey sediment. Slopes range from 1 to 5 percent.

Soils of the Etoile series are fine, montmorillonitic, thermic Vertic Hapludalfs.

Typical pedon of Etoile loam, 1 to 5 percent slopes; in timber, northeast of Lufkin, 0.6 mile past the end of paved Farm Road 842 on dirt road, 800 yards south on timber road, 300 yards west and 50 feet south of another timber road. This pedon is on map sheet 8.

A—0 to 3 inches; dark grayish brown (10YR 4/2) loam; moderate medium granular structure; slightly hard, friable; common roots of all sizes; medium acid; abrupt wavy boundary.

E—3 to 5 inches; pale brown (10YR 6/3) loam; massive; slightly hard, friable; common medium and coarse roots; medium acid; clear wavy boundary.

Bt1—5 to 9 inches; yellowish red (5YR 4/8) clay; common medium distinct light gray (10YR 6/1) mottles; moderate medium blocky structure; extremely hard, very firm; common medium and coarse roots; strongly acid; gradual smooth boundary.

Bt2—9 to 27 inches; mottled yellowish red (5YR 5/8), yellowish brown (10YR 5/6), and light gray (10YR 6/1) clay; weak medium subangular blocky structure; extremely hard, very firm; few pebbles of ironstone; few small slickensides; few medium and coarse roots; neutral; gradual smooth boundary.

Bk—27 to 47 inches; olive (5Y 5/3) clay; pale olive (5Y 6/3) mottles in lower part; weak medium subangular blocky structure; extremely hard, very firm; few flattened roots; common small slickensides; common soft and hard rounded masses of lime; slightly effervescent; moderately alkaline; clear smooth boundary.

C—47 to 60 inches; light olive brown (2.5Y 5/6) and gray (5Y 6/1) platy clay; extremely hard, very firm; many soft rounded masses and seams of lime; strongly effervescent; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches. Depth to the calcareous material ranges from 25 to 50 inches.

The combined thickness of the A and E horizons is less than 10 inches. Reaction ranges from strongly acid to neutral. The A horizon is very dark grayish brown, dark grayish brown, dark brown, and brown. The E horizon is brown, pale brown, light brownish gray, light yellowish brown, or brownish yellow. Some pedons do not have an E horizon.

The upper part of the Bt horizon is red, yellowish red, or strong brown. It has mottles of yellowish brown, gray, and light brownish gray. Gray mottles are generally more abundant as depth increases. Reaction ranges from very strongly acid to neutral. The lower part of the Bt horizon and the Bk horizon are light brownish gray, light olive brown, olive brown, olive, pale olive, or olive yellow. They have mottles of yellowish red, yellowish brown, and gray. Reaction ranges from neutral to moderately alkaline.

The C horizon is similar in color to the lower part of the Bt horizon and the Bk horizon. It is laminated or platy, calcareous clay or marl.

Fuller Series

The Fuller series consists of deep, somewhat poorly drained soils on uplands (fig. 19). Permeability is very slow. These nearly level or gently sloping soils formed in loamy sediment deposited over siltstone mainly in the Yegua Formation. Slopes range from 0 to 4 percent.

Soils of the Fuller series are fine-loamy, siliceous, thermic Albic Glossic Natraqualfs.

Typical pedon of Fuller fine sandy loam, 1 to 4 percent slopes; in forest, about 4 miles south of Lufkin, from the intersection of Farm Road 58 and Farm Road 2108 at Fairview Church, 0.1 mile west on Farm Road 2108 to pipeline, 200 feet south on pipeline, and 20 feet east. This pedon is on map sheet 22.

A—0 to 6 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak medium granular structure; soft, friable; many fine, medium, and coarse roots; very strongly acid; clear smooth boundary.

Eg1—6 to 18 inches; grayish brown (10YR 5/2) fine sandy loam; strong brown (7.5YR 5/6) stains along a few root channels; massive but porous; soft, friable; many fine, medium, and coarse roots; very strongly acid; abrupt smooth boundary.

Eg2—18 to 24 inches; dark grayish brown (10YR 4/2) fine sandy loam; few horizontal grayish brown (10YR 5/2) streaks; massive but porous; soft, friable;

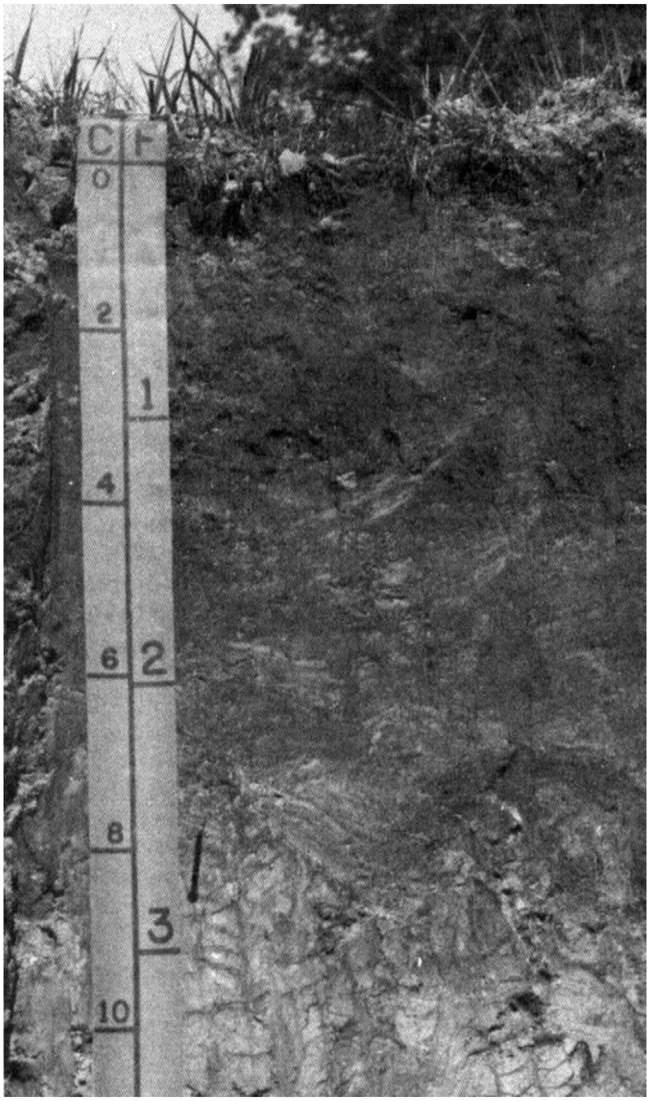


Figure 19.—Profile of Fuller fine sandy loam, 1 to 4 percent slopes. The soil developed over a mudstone that contains volcanic debris. The mudstone is at a depth of about 3 feet.

common fine roots; very strongly acid; clear wavy boundary.

Eg3—24 to 34 inches; light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) fine sandy loam in horizontal streaks; few dark gray (10YR 4/1) streaks of silty clay loam; common crayfish burrows filled with light gray (10YR 7/2) fine sandy loam; hard, friable; common fine roots; silty clay loam material has slick soapy consistency; strongly acid; clear wavy boundary.

Eg4—34 to 39 inches; light gray (10YR 7/2) fine sandy loam (possibly discontinuous); many horizontal streaks of dark gray (10YR 4/1) and grayish brown (10YR 5/2) silty clay loam; massive but porous; hard, friable; common fine roots; slightly acid; clear very wavy boundary.

Btng/E—39 to 47 inches; pale olive (5Y 6/3) silty clay loam, dark grayish brown (10YR 4/2) soil material about 6 mm thick surrounds most peds (Bt), about 30 percent tongues of light gray (10YR 7/2) loam (E) between peds; moderate medium columnar structure parting to weak medium blocky; hard, friable, sticky and plastic; few fine roots mainly in E material; common rounded crayfish burrows filled with E material and having cups of dark gray (10YR 4/1) clayey material at bottom; about 50 percent, by volume, Bt material that has slick soapy consistency; about 20 percent of the matrix ped interiors is siltstone that breaks conchoidal; neutral; clear very wavy boundary.

2Cr/Btz—47 to 58 inches; pale olive (5Y 6/3) siltstone that has conchoidal fractures; coatings about 2 mm thick of dark gray (10YR 4/1) silty clay loam (Bt) on fracture planes; interfingers 2 to 5 mm thick of light gray (10YR 7/2) silt loam (E) in cracks and crevices; very hard, very firm; few fine roots along cracks; few crayfish burrows filled with light gray (10YR 7/2) fine sandy loam with dark gray (10YR 4/1) clay cups; burrows lined with grayish brown (10YR 5/2) silty clay loam; Bt part has slight soapy consistency; thin black coatings of iron-manganese on some horizontal faces; few fine masses of powdery barite; mildly alkaline; gradual smooth boundary.

2Cryz—58 to 70 inches; pale olive (5Y 6/3) siltstone; thin black iron-manganese layers on most rock faces; many spots of gypsum crystals and barite; yellowish coatings of jarosite on some faces; moderately alkaline.

The thickness of the solum ranges from 30 to 50 inches. Depth to paralithic contact ranges from 40 to 60 inches. The electrical conductivity ranges from 1.0 to 4.0 mmhos/cm below the Eg horizon. Crayfish are very active in this soil.

The combined thickness of the A and E horizons ranges from 23 to 45 inches. The A horizon has colors of brown, grayish brown, or dark grayish brown. Reaction ranges from very strongly acid to medium acid. The E horizon is very fine sandy loam, fine sandy loam, or loam. It is grayish brown, light brownish gray, gray, and light gray. Mottles in shades of red and brown range from none to many. In most pedons, the E horizon contains waves or swirls of silty clay loam material that is dark gray, gray, very dark gray, dark grayish brown, and very dark grayish brown. Reaction ranges from very strongly acid to slightly acid.

The E part of the Btng/E horizon and the 2Cr/Btz horizon consist of tongues, filled crayfish holes, and streaks of very fine sandy loam, fine sandy loam, or

loam. It has the same colors as the E horizon. The Btng and Btz parts of these horizons consist of streaks, splotches, or suspended bodies of loam or silty clay loam. They are dark gray, gray, grayish brown, and dark grayish brown. The Cr part of the 2Cr/Btz horizon consists of siltstone that has conchoidal fractures. It has matrix colors of yellowish brown to olive. Reaction ranges from slightly acid to moderately alkaline. Clay content of the Btng and Btz parts of these horizons averages 18 to 35 percent, and the silt content ranges from 25 to 35 percent. Few spots of barite and other salts are common in most pedons. Mottles in shades of brown or yellow range from none to common and are mainly in the interior of peds.

The 2Cryz horizon is weakly cemented siltstone that is strong brown to yellowish brown and olive. The siltstone fractures in conchoidal shapes. Barite, gypsum, calcite, and other salts are common in most pedons. Reaction ranges from neutral to moderately alkaline.

Herty Series

The Herty series consists of deep, somewhat poorly drained soils on uplands. Permeability is very slow. These soils are mainly in the Manning, Caddell, and Yegua Formations. These soils are generally shale, clay, or soft mudstone deposits. Landscapes are generally smooth or slightly concave. Slopes range from 0 to 5 percent.

Soils of the Herty series are fine, montmorillonitic, thermic Vertic Albaqualfs.

Typical pedon of Herty very fine sandy loam, 1 to 5 percent slopes; about 15 miles south of Lufkin, from the intersection of Farm Road 844 and Farm Road 1818 at Flournoy Crossing, 2 miles west on Farm Road 1818, 0.4 mile south and 50 feet east of logging road. This pedon is on map sheet 35.

A—0 to 3 inches; dark grayish brown (10YR 4/2) very fine sandy loam; weak medium granular structure; soft, friable, nonplastic; many coarse and medium roots; very strongly acid; clear smooth boundary.

Bt1—3 to 11 inches; dark grayish brown (10YR 4/2) clay loam; few yellowish red (5YR 5/8) mottles on ped surfaces; common medium distinct yellowish red (5YR 5/8) and strong brown (7.5YR 5/8) mottles on interior of peds; weak medium subangular blocky structure; very hard, very firm, very sticky and very plastic; many roots of all sizes; very strongly acid; gradual wavy boundary.

Bt2—11 to 21 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common medium and fine roots; extremely acid; gradual wavy boundary.

Bt3—21 to 25 inches; grayish brown (2.5Y 5/2) clay; few medium distinct yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common fine roots; very large slickensides; extremely acid; gradual smooth boundary.

Bty—25 to 30 inches; grayish brown (2.5Y 5/2) clay; few medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common fine roots; very large slickensides; about 30 percent, by volume, of matrix is gypsum crystals; extremely acid; gradual smooth boundary.

B/Cy—30 to 44 inches; pale olive (5Y 6/3) clayey shale; massive, very weak subangular blocky structure near very large slickensides; gypsum in horizontal layers; very hard, firm; few fine roots in cracks; very strongly acid; gradual smooth boundary.

Cy1—44 to 57 inches; pale olive (5Y 6/3) clayey shale; massive; very hard, firm; 20 to 30 percent gypsum mostly in horizontal layers; few black iron-manganese coatings; few fine roots in cracks; strongly acid; gradual smooth boundary.

Cy2—57 to 70 inches; pale olive (5Y 6/3) clayey shale; massive; very hard, firm; 10 to 15 percent gypsum; few black iron-manganese coatings; few jarosite and natrojarosite coatings and spots of barite and calcite; strongly acid.

The thickness of the solum ranges from 40 to 60 inches. The electrical conductivity ranges from 2.0 to 8.0 mmhos/cm in the Bt3, Bty, B/Cy, and Cy horizons. An electrical conductivity of 2.0 mmhos/cm or more is generally at a depth of more than 10 inches; however, local spots (slick spots) have an electrical conductivity of 7 or more at the soil surface.

The A horizon is very dark grayish brown, dark grayish brown, dark brown, or brown. It is less than 10 inches thick. Reaction ranges from medium acid to very strongly acid.

Some pedons have an E horizon that is pale brown, light brown, light brownish gray, or light gray.

The Bt horizon is grayish brown, light brownish gray, gray, dark gray, or dark grayish brown. It has mottles of red to yellowish red and strong brown. Reaction ranges from strongly acid to extremely acid. The electrical conductivity ranges from 1 to 4. The texture is clay loam, clay, or silty clay loam. The clay content is 35 to 45 percent.

The Bty and B/Cy horizons have similar colors as the Bt horizon and also include pale olive. The texture is clay or silty clay. Barite is present, and gypsum occurs as a whitish powder or as crystals. Reaction is very strongly acid or extremely acid. The electrical conductivity ranges from 4 to 10 mmhos/cm.

The Cy horizon is olive or grayish brown clayey shale, clay, or soft mudstone. Visible gypsum and barite are in most pedons. Calcite, jarosite, and natrojarosite are in

many pedons. Reaction is very strongly acid or extremely acid.

Iuka Series

The Iuka series consists of deep, loamy, moderately well drained soils on bottom lands. Permeability is moderate. The soils formed in recent alluvium. Slopes are less than 1 percent. The soils are subject to occasional flooding.

Soils of the Iuka series are coarse-loamy, siliceous, acid, thermic Aquic Udifluvents.

Typical pedon of Iuka fine sandy loam, occasionally flooded; 1.7 miles east of Lufkin State School on Farm Road 2021, 1.5 miles north and 300 feet east of county road, in Procella Creek bottom. This pedon is on map sheet 6.

A1—0 to 4 inches; dark brown (10YR 3/2) fine sandy loam; weak medium granular structure; friable, slightly hard; many roots of all sizes; few worm casts; common fine pores; strongly acid; clear smooth boundary.

A2—4 to 18 inches; dark brown (10YR 4/3) fine sandy loam; weak medium granular structure; friable, slightly hard; common roots of all sizes; common fine and very fine pores; strongly acid; gradual smooth boundary.

C1—18 to 30 inches; distinctly mottled gray (10YR 6/1), strong brown (7.5YR 5/6), and yellowish red (5YR 5/8) fine sandy loam; massive; friable, slightly hard; many fine roots; few fine pores; strongly acid; gradual smooth boundary.

C2—30 to 47 inches; distinctly mottled gray (10YR 6/1) and dark brown (10YR 4/3) fine sandy loam; massive; friable, slightly hard; few fine roots; strongly acid; gradual boundary.

C3—47 to 60 inches; gray (10YR 6/1) fine sandy loam; strong brown (7.5YR 5/6) and yellowish red (5YR 5/8) mottles; massive; friable, slightly hard; strongly acid.

Thin bedding planes or buried horizons are common in some pedons. Reaction is strongly acid or very strongly acid unless lime has been added.

The A horizon is brown, dark grayish brown, or dark brown.

The C1 horizon has high chroma light yellowish brown, yellowish brown, pale brown, brown, strong brown, yellowish red, or dark grayish brown. Mottles with low chroma gray, light gray, and light grayish brown range from few to many to a depth of 24 inches. The C2 and C3 horizons are mottled in shades of gray and brown, or the horizons are dominantly gray and have many brown, red, or yellow mottles. The C horizon is sandy loam, fine sandy loam, or loam. Clay content of the 10- to 40-inch control section is 10 to 18 percent. A few fine black and brown concretions occur in some pedons.

Keithville Series

The Keithville series consists of deep, somewhat poorly drained soils on terraces and low uplands. Permeability is slow. The soils formed in thin material that was partly reworked by wind and deposited over more clayey sediment. Slopes are generally less than 3 percent.

Soils of the Keithville series are fine-silty, siliceous, thermic Glossaquic Paleudalfs.

Typical pedon of Keithville silt loam, in an area of Keithville-Sawtown complex, gently undulating; about 11 miles north of Lufkin, 3 miles west of Pollok, 0.5 mile east on Texas Highway 7 from the intersection with Farm Road 1819, about 150 feet south, in timber. This pedon is on map sheet 4.

A—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; soft, friable, nonsticky and nonplastic; many coarse and medium roots; medium acid; clear wavy boundary.

E—3 to 10 inches; pale brown (10YR 6/3) silt loam; massive but porous; many strong brown (7.5YR 5/6) stains along roots channels; hard, friable, nonsticky and nonplastic; many roots of all sizes; strongly acid; clear wavy boundary.

Bt—10 to 21 inches; strong brown (7.5YR 5/8) silt loam; weak medium subangular blocky structure; few medium distinct light gray (10YR 6/1) mottles; hard, firm, slightly sticky and slightly plastic; many medium and fine roots; strongly acid; gradual wavy boundary.

Bt/E—21 to 34 inches; distinctly mottled strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) clay loam; light gray (10YR 6/1) loamy material on ped interiors; weak coarse prismatic structure parting to weak medium subangular blocky; hard, firm, sticky and plastic; strongly acid; gradual wavy boundary.

2Bt/E—34 to 52 inches; prominently mottled yellowish red (5YR 5/6), strong brown (7.5YR 5/6), and light gray (10YR 6/1) clay loam; light gray (10YR 6/1) silt coatings and stripped areas on ped interiors; weak coarse prismatic structure parting to weak subangular blocky; hard, firm, sticky and plastic; few fine roots; strongly acid; gradual wavy boundary.

2Bt—52 to 65 inches; light gray (10YR 6/1) clay loam; common medium distinct strong brown (7.5YR 5/6) and pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; hard, firm; strongly acid; gradual wavy boundary.

3C—65 to 80 inches; layers of grayish brown (10YR 5/2), light brownish gray (10YR 6/2), and yellowish brown (10YR 5/6) shale; strongly acid.

The thickness of the solum exceeds 60 inches and has a base saturation of 45 to 85 percent at 50 inches below the top of the argillic horizon.

The combined thickness of the A and E horizons ranges from 7 to 16 inches. The A horizon is dark grayish brown or brown. The E horizon is brown, pale brown, or very pale brown. Texture is very fine sandy loam or silt loam. Reaction is strongly acid or medium acid.

The Bt horizon is loam, silt loam, or silty clay loam that is strong brown or yellowish brown. Low chroma pale brown, light gray, or light brownish gray mottles are none to common. Some pedons have high chroma red or yellowish red mottles. Reaction is strongly acid or medium acid.

The Bt/E and 2Bt/E horizons are clay loam or clay. High chroma colors are red, yellowish red, strong brown, or yellowish red. Low chroma colors are light brownish gray or light gray. Interfingers of streaks, pockets, and ped coats that have the same low chroma colors make up 5 to 20 percent of the Bt/E and 2Bt/E horizons. Reaction is strongly acid or very strongly acid.

Clay content of the upper 20 inches of the argillic horizon ranges from 20 to 35 percent, and silt content ranges from 25 to 50 percent.

The 2Bt horizon is generally clay loam or clay. It has the same colors as the Bt/E and 2Bt/E horizons.

The 3C horizon is generally shale. This shale is dense and often contains gypsum and other salts. Some pedons do not have a 3C horizon.

These soils are taxadjuncts to the Keithville series because field data show the weighted average of fine sand and coarser in the control section to be 17 percent. In addition, these soils have a Bt/E horizon that is 3 inches thicker than the range of the official series and also have a 2Bt/E horizon. The use, management, and behavior of these soils are not affected by these differences.

Keltys Series

The Keltys series consists of moderately well drained, slowly permeable soils that formed in coastal plain sediment. These nearly level to strongly sloping soils are on broad interstream divides and on sloping to moderately steep side slopes. A perched water table is 30 to 40 inches below the surface late in winter and early in spring. Slopes range from 1 to 15 percent.

Soils of the Keltys series are coarse-loamy, siliceous, thermic Aquic Glossudalfs.

Typical pedon of Keltys fine sandy loam, 1 to 5 percent slopes; about 3 miles south of Huntington; 1,400 feet south on U.S. Highway 69 from intersection with Farm Road 844, 300 yards east on forest road and 50 feet north, in a plantation. This pedon is on map sheet 23.

A—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak medium granular structure; soft, very friable; many roots of all sizes; strongly acid; clear wavy boundary.

E1—5 to 10 inches; brown (10YR 5/3) fine sandy loam; common medium distinct yellowish red (5YR 5/8) stains along roots; weak medium subangular blocky structure; soft, very friable; many roots of all sizes; strongly acid; gradual smooth boundary.

E2—10 to 26 inches; pale brown (10YR 6/3) fine sandy loam; few fine faint light gray and few fine distinct strong brown (7.5YR 5/6) stains along roots; massive but porous; soft, very friable; common medium and fine roots; strongly acid; gradual wavy boundary.

Bt/E1—26 to 42 inches; strong brown (7.5YR 5/6) fine sandy loam; common medium distinct vertical mottles and tongues of light brownish gray (10YR 6/2); weak medium subangular blocky structure; hard, friable, nonplastic; few fine roots; very strongly acid; gradual wavy boundary.

Bt/E2—42 to 48 inches; strong brown (7.5YR 5/6) fine sandy loam; about 30 percent vertical mottles and tongues of grayish brown (10YR 5/2); common medium distinct mottles of yellowish red; weak medium subangular blocky structure; hard, friable, nonplastic; few fine roots; very strongly acid; gradual wavy boundary.

2Cr/Bt—48 to 53 inches; light yellowish brown (2.5Y 6/4) weathered and fractured soft siltstone; many strong brown (7.5YR 5/6) mottles; dark grayish brown (10YR 4/2) clayey material and thick dark gray (10YR 4/1) clay films filling cracks and crevices; few fine roots; hard, friable; extremely acid; gradual wavy boundary.

2Cr1—53 to 60 inches; light yellowish brown (2.5Y 6/4) siltstone; many yellowish red (5YR 5/8) mottles; thick clay flows of dark gray (10YR 4/1) filling cracks; few fine roots in cracks; strongly acid; gradual boundary.

2Cr2—60 to 80 inches; light yellowish brown (2.5Y 6/4) hard siltstone in plates; strongly acid.

The thickness of the solum ranges from 40 to 60 inches.

The combined thickness of the A and E horizons ranges from 15 to 35 inches. The A horizon is dark brown, dark grayish brown, or brown. Reaction ranges from strongly acid to slightly acid. The E horizon is brown, pale brown, or light brownish gray. Reaction is strongly acid or medium acid.

The Bt/E horizon is mottled and tongued in different colors and textures. High chroma colors are red, yellowish red, strong brown, or yellowish brown. Low chroma colors are gray, light gray, or light brownish gray. The texture of the Bt/E horizon is generally fine sandy loam, but it is sandy clay loam in the lower part of some pedons. Reaction is very strongly acid or strongly acid. Clay content in the upper 20 inches of this horizon ranges from 8 to 18 percent, and silt content ranges

from 15 to 30 percent. Base saturation at the paralithic contact ranges from 35 to 45 percent.

The Cr horizon is weakly cemented siltstone. Some pedons contain layers of shale and sandstone. Base saturation ranges from 35 to 60 percent.

Kirvin Series

The Kirvin series consists of deep, loamy, well drained soils on uplands. Permeability is moderately slow. These soils formed in acid, stratified sandstone and shaly sediment. Slopes range from 1 to 5 percent.

Soils of the Kirvin series are clayey, mixed, thermic Typic Hapludults.

Typical pedon of Kirvin fine sandy loam, 1 to 5 percent slopes; southwest of Wells near the Cherokee County line, 1.2 miles northwest on Farm Road 1819 from intersection with Texas Highway 7, 3 miles north on a dirt road, 2 miles southeast and 50 feet north of road. This pedon is on map sheet 4.

A—0 to 4 inches; dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; slightly hard, very friable; many fine roots; about 5 to 6 percent, by volume, pebbles of ironstone; medium acid; clear smooth boundary.

E—4 to 11 inches; pale brown (10YR 6/3) fine sandy loam; massive; slightly hard, friable; few fine roots; about 5 percent, by volume, pebbles of ironstone; strongly acid; clear wavy boundary.

Bt1—11 to 24 inches; red (2.5YR 4/6) clay; few fine distinct strong brown (7.5YR 5/8) mottles; moderate medium blocky structure; hard, firm; common fine roots; thick continuous clay films; strongly acid; gradual smooth boundary.

Bt2—24 to 35 inches; red (2.5YR 4/8) clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; hard, firm; common fine roots; thick continuous clay films; strongly acid; gradual smooth boundary.

Bt3—35 to 46 inches; yellowish red (5YR 5/8) clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate coarse blocky structure; slightly hard, friable; few fine roots; red clay flows between peds; common horizontal gray shale fragments; few flakes of mica; very strongly acid; clear wavy boundary.

C—46 to 65 inches; stratified yellowish red (5YR 5/6) soft sandstone; faint strong brown (7.5YR 5/6) mottles and light gray (10YR 7/1) shale plates; few fine flakes of mica; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches.

The combined thickness of the A and E horizons ranges from 3 to 16 inches. The A horizon is dark brown, brown, dark grayish brown, or dark reddish brown. It is fine sandy loam or gravelly fine sandy loam. In some pedons, ironstone pebbles make up as much as 35 percent of the A horizon; in other pedons, they make up as little as 1 percent. Reaction ranges from neutral to strongly acid. The E horizon is brown, light brown, pale brown, yellowish red, or strong brown.

The Bt1 and Bt2 horizons are red or yellowish red. The Bt3 horizon is mainly yellowish red, reddish brown, or red. The upper part of the Bt horizon is clay or clay loam and the lower part is sandy clay loam or clay loam. Clay content averages about 45 percent and ranges from 35 to 60 percent. Ironstone pebbles make up about 1 to 10 percent, by volume, of the Bt horizon. Base saturation is 15 to 35 percent. Reaction ranges from extremely acid to strongly acid.

The C horizon is soft sandstone in shades of brown and red interbedded or stratified with gray shale. Texture ranges from sandy loam to clay loam. In some pedons, the C horizon is weakly consolidated or cemented but can be cut with a spade. Reaction is extremely acid or very strongly acid.

Kisatchie Series

The Kisatchie series consists of moderately deep, loamy, well drained soils. Permeability is very slow. These soils formed in acid tuffaceous material mainly in the Catahoula Formation. Slopes range from 5 to 15 percent.

Soils of the Kisatchie series are fine, montmorillonitic, thermic Typic Hapludalfs.

Typical pedon of Kisatchie fine sandy loam, 5 to 15 percent slopes; about 0.5 mile north of the Jasper County line, 2.7 miles east on county line road from the intersection with U.S. Highway 69, 600 yards north on logging road and 100 feet west of road. This pedon is on map sheet 48.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) fine sandy loam; weak fine granular structure; very friable, soft; common fine roots; strongly acid; clear smooth boundary.

E—4 to 6 inches; brown (10YR 5/3) fine sandy loam; massive but porous; friable, slightly hard; common fine roots; strongly acid; abrupt smooth boundary.

Bt1—6 to 24 inches; grayish brown (2.5Y 5/2) silty clay; many medium distinct olive brown (2.5Y 4/4) mottles; moderate medium blocky structure; very firm, very hard, very plastic and sticky; few small pressure faces; few clay films; common fine roots; very strongly acid; gradual wavy boundary.

Bt2—24 to 36 inches; light brownish gray (2.5Y 6/2) clay; few fine olive (5Y 4/4) mottles; weak fine blocky structure; very firm, very hard, very plastic and sticky; few small pressure faces; few clay films; few fine roots; very strongly acid; gradual wavy boundary.

Cr—36 to 40 inches; olive (5Y 5/3, 5/4) unconsolidated volcanic tuff; few thin layers of yellow (10YR 6/6) iron-stained tuffaceous material; massive; very strongly acid.

The thickness of the solum ranges from 20 to 40 inches.

The Ap horizon is 3 to 14 inches thick. It is very dark gray, very dark grayish brown, dark gray, or dark grayish brown. Reaction is strongly acid or very strongly acid.

The E horizon is dark grayish brown, grayish brown, brown, or light brownish gray.

The Bt horizon is dark grayish brown, grayish brown, light brownish gray, or olive gray. It is clay or silty clay. Red and brown mottles are few or common. The upper 20 inches of the Bt horizon averages between 40 and 60 percent clay but can contain up to 70 percent. Reaction ranges from extremely acid to strongly acid.

The Cr horizon is weakly consolidated tuffaceous sandstone that is bentonitic but contains volcanic ash, volcanic glass, and other pyroclastic material. Reaction ranges from medium acid to extremely acid.

Koury Series

The Koury series consists of deep, loamy, moderately well drained soils on bottom lands. Permeability is moderately slow. These soils formed in recent alluvium. Slopes are less than 1 percent. These soils are subject to occasional flooding.

Soils of the Koury series are coarse-silty, siliceous, thermic Fluvaquentic Dystrochrepts.

Typical pedon of Koury loam, occasionally flooded; about 25 miles southeast of Lufkin, south of Zavalla from intersection of U.S. Highway 69 and Boykin Springs Road (Forest Service Road 302), 7.2 miles east, 0.4 mile southeast across Green Creek channel. This pedon is on map sheet 44.

A1—0 to 3 inches; pale brown (10YR 6/3) loam; weak medium subangular blocky structure; slightly hard, very friable; many medium and coarse roots; common fine pores; extremely acid; clear smooth boundary.

A2—3 to 10 inches; pale brown (10YR 6/3) very fine sandy loam; weak medium subangular blocky structure; slightly hard, very friable; many fine and medium roots; common fine pores; common fine black concretions; extremely acid; clear wavy boundary.

A3—10 to 17 inches; pale brown (10YR 6/3) loam; massive; slightly hard, very friable; many fine and medium roots; many medium pores; very strongly acid; clear wavy boundary.

Bw—17 to 28 inches; pale brown (10YR 6/3) silt loam; common medium faint light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; hard, friable; common fine and medium roots; common fine and very fine pores; extremely acid; gradual wavy boundary.

Bg—28 to 50 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; hard, friable; few fine and medium roots; few fine pores; extremely acid; gradual wavy boundary.

Cg—50 to 70 inches; dark grayish brown (10YR 4/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive but porous; slightly hard, friable; few fine roots; few fine pores; many light brownish gray sand coatings on ped exteriors; few white salt crystals in lower part; extremely acid.

The A horizon is dark brown, brown, pale brown, dark grayish brown, or grayish brown. The electricity conductivity is less than 2.0.

The Bw and Bg horizons are silt loam, loam, or very fine sandy loam. The Bw horizon is dark brown, brown, or pale brown. The Bg horizon is gray, light gray, light brownish gray, or grayish brown. It has red, yellowish red, strong brown, or yellowish brown mottles. Some buried layers are very dark grayish brown. The electricity conductivity is less than 1.0.

The Cg horizon is gray or light gray silt loam. The Electricity conductivity is less than 4.0.

Reaction ranges from strongly acid to extremely acid throughout.

Kurth Series

The Kurth series consists of deep, moderately well drained, slowly permeable soils that formed in mixed coastal plain sediment. These soils are on broad interstream divides and on gently sloping side slopes. A perched water table is 30 to 40 inches below the surface in winter and in spring. Slopes range from 0 to 4 percent.

Soils of the Kurth series are fine-loamy, siliceous, thermic Aquic Glossudalfs.

Typical pedon of Kurth fine sandy loam, 0 to 4 percent slopes; about 5 miles southeast of Lufkin, from intersection of Loop 287 and U.S. Highway 69, 27 miles southeast on U.S. Highway 69 and 50 feet west, in a pasture. This pedon is on map sheet 17.

A1—0 to 4 inches; dark brown (10YR 4/3) fine sandy loam; weak medium granular structure; soft, friable, slightly sticky and nonplastic; many fine and medium roots; slightly acid; clear smooth boundary.

A2—4 to 11 inches; brown (10YR 5/3) fine sandy loam; weak medium granular structure; soft, friable, slightly sticky and nonplastic; common fine and medium roots; strongly acid; clear smooth boundary.

E1—11 to 21 inches; pale brown (10YR 6/3) fine sandy loam; massive; soft, friable, slightly sticky and

nonplastic; common fine roots; strongly acid; gradual wavy boundary.

E2—21 to 27 inches; pale brown (10YR 6/3) fine sandy loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; soft, friable, slightly sticky and nonplastic; few fine roots; strongly acid; gradual wavy boundary.

Bt/E1—27 to 33 inches; yellowish brown (10YR 5/6) fine sandy loam; common medium distinct light brownish gray (10YR 6/2) mottles; about 20 percent tongues of light brownish gray (10YR 6/2); weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; patchy clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt/E2—33 to 46 inches; mottled strong brown (7.5YR 5/6) and red (2.5YR 4/8) sandy clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; about 25 percent tongues of light brownish gray (10YR 6/2) fine sandy loam; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; clay films on faces of peds; very strongly acid, clear smooth boundary.

Bt/E3—46 to 56 inches; light brownish gray (10YR 6/2) sandy clay loam; common medium prominent red (2.5YR 4/8) and yellowish brown (10YR 5/6) mottles; about 35 percent tongues of light brownish gray (10YR 6/2) fine sandy loam; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; clay films on faces of peds; very strongly acid; clear smooth boundary.

Cr—56 to 65 inches; light brownish gray (10YR 6/2) sandstone that has yellowish brown (10YR 5/6) stains.

The thickness of the solum ranges from 45 to 60 inches.

The combined thickness of the A and E horizons is 16 to 30 inches. The A horizon ranges from 2 to 16 inches thick. It is brown, dark brown, very dark grayish brown, dark grayish brown, and grayish brown. Reaction ranges from slightly acid to strongly acid. The E horizon ranges from 4 to 24 inches thick. It is brown or pale brown. Reaction is medium acid or strongly acid.

The upper part of the Bt/E horizon is fine sandy loam, loam, or sandy clay loam. Clay content ranges from 25 to 35 percent, and silt content ranges from 15 to 30 percent. High chroma colors are strong brown, reddish yellow, yellowish brown, and brownish yellow. Low chroma colors are pale brown, light gray, and light brownish gray. The lower part of the Bt/E horizon is clay loam and sandy clay loam. High chroma colors are red, yellowish red, strong brown, and yellowish brown. Low chroma colors are light brownish gray, light gray, grayish brown, and pale brown. Tongues of E material range from 15 to 40 percent, by volume. Base saturation is 35 to 60 percent. Reaction of the Bt/E horizon is very strongly acid or strongly acid.

The Cr horizon is a weakly cemented sandstone. Some pedons contain layers of shale and siltstone.

Lacerda Series

The Lacerda series consists of deep, clayey, somewhat poorly drained soils on uplands. Permeability is very slow. These soils formed in clayey coastal plain sediment. Slopes range from 0 to 4 percent.

Soils of the Lacerda series are very-fine, montmorillonitic, thermic Aquentic Chromuderts.

Typical pedon of Lacerda clay loam, 0 to 4 percent slopes; in timber, about 7 miles east of Lufkin, 1 mile past end of Farm Road 842 pavement, 0.4 mile south on a dirt road, and 50 feet west. This pedon is on map sheet 8.

A—0 to 2 inches; dark grayish brown (10YR 4/2) clay loam; weak medium granular structure; hard, friable; many roots of all sizes; strongly acid; abrupt wavy boundary.

Bw1—2 to 7 inches; distinctly mottled red (2.5YR 4/8), strong brown (7.5YR 5/8), and light gray (10YR 6/1) silty clay; weak medium blocky structure; hard, firm; many roots of all sizes; very strongly acid; gradual wavy boundary.

Bw2—7 to 15 inches; red (2.5YR 4/8) clay; many medium prominent light gray (10YR 6/1) mottles; weak medium subangular blocky structure; extremely hard, extremely firm; common medium roots; very strongly acid; gradual wavy boundary.

Bw3—15 to 21 inches; prominently mottled red (2.5YR 4/8) and light gray (10YR 6/1) clay; weak medium subangular blocky structure; extremely hard, extremely firm; common fine roots; very strongly acid; gradual wavy boundary.

Bg—21 to 42 inches; light brownish gray (10YR 6/2) clay; many medium prominent red (2.5YR 4/8) mottles; weak medium subangular blocky structure; extremely hard, extremely firm; few medium roots; few large intersecting slickensides; strongly acid; gradual wavy boundary.

Cy—42 to 60 inches; light yellowish brown (2.5Y 6/4) and light brownish gray (2.5Y 6/2) layered clay and shale; very hard, very firm; common crystals of gypsum; neutral.

The thickness of the solum ranges from 40 to 60 inches. This soil has gilgai microrelief. The distance from the center of the microknoll to the center of the microdepression is 8 to 15 feet; microknolls are 4 to 10 inches higher than the microdepressions. Depth to intersecting slickensides ranges from 17 to 31 inches. The extremes of amplitude, or waviness, between the Bw and Bg horizons range from 8 to 24 inches.

The A horizon ranges in thickness from less than 1 inch on the microknoll to 6 inches in the microdepression. It is very dark grayish brown, very dark gray, dark grayish brown, dark gray, or dark brown. Reaction is strongly acid or medium acid.

The Bw horizon is silty clay or clay; however, a few pedons are silty clay loam in the upper few inches. The Bw horizon is yellowish brown, strong brown, yellowish red, or red. It has light brownish gray, grayish brown, or gray mottles. Reaction ranges from very strongly acid to medium acid.

The Bg horizon is light brownish gray, grayish brown, light olive brown, or light yellowish brown clay. It has gray, strong brown, yellowish red, olive yellow, or olive mottles. Reaction ranges from strongly acid to neutral.

The Cy horizon is layered clay, marl, or shale. Reaction ranges from medium acid to moderately alkaline.

Letney Series

The Letney series consists of deep, well drained soils on uplands. Permeability is moderately rapid. These soils formed in thick sandy and loamy sediment of the coastal plains. These gently sloping or sloping soils are on uplands. Slopes range from 1 to 8 percent.

Soils of the Letney series are loamy, siliceous, thermic Arenic Paleudults.

Typical pedon of Letney loamy sand, 1 to 8 percent slopes; in extreme south Angelina County about 0.5 mile north of Jasper County line, from intersection with Texas Highway 63, 1.2 miles east on dirt road, and 200 yards south. This pedon is on map sheet 45.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loamy sand; single grained; loose; few medium and coarse roots; strongly acid; clear smooth boundary.

E1—5 to 9 inches; brown (10YR 5/3) loamy sand; single grained; loose; few medium and coarse roots; strongly acid; clear smooth boundary.

E2—9 to 35 inches; pale brown (10YR 6/3) loamy sand; single grained; loose; few medium and coarse roots; few siliceous gravel; few krotovinas; strongly acid; clear smooth boundary.

Bt1—35 to 61 inches; yellowish brown (10YR 5/6) sandy clay loam; yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few medium roots; common siliceous gravel; sand grains coated and bridged with clay; very strongly acid; gradual smooth boundary.

Bt2—61 to 80 inches; yellowish brown (10YR 5/6) sandy clay loam; many medium distinct red (2.5YR 4/8) and light gray (10YR 6/1) mottles; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many small white and purple shale and clay bodies; very strongly acid.

The thickness of the solum ranges from 60 to more than 80 inches. Clay content of the upper 20 inches of the argillic horizon ranges from 18 to 32 percent. The sand fraction is 10 to 25 percent coarse and very coarse sand. Some pedons contain up to 10 percent siliceous gravels. Base saturation ranges from 15 to 30 percent. Reaction ranges from very strongly acid to medium acid throughout the profile.

The combined thickness of the A and E horizons is 20 to 40 inches. The A horizon is grayish brown, brown, dark brown, dark grayish brown, and very dark grayish brown. The E horizon is brown, pale brown, light yellowish brown, and very pale brown.

The Bt horizon is strong brown, yellowish red, or yellowish brown. Mottles in shades of red and gray are in the lower part of the Bt horizon. Mottles that have chroma of 2 or less are 60 inches or more below the surface. The texture of the Bt horizon is mostly sandy clay loam, but includes sandy loam. In some pedons, the Bt horizon contains up to 5 percent plinthite, by volume.

Lilbert Series

The Lilbert series consists of deep, sandy, well drained soils on uplands. Permeability is moderately slow. These soils formed in stratified sandy and loamy sediment. Slopes range from 1 to 5 percent.

Soils of the Lilbert series are loamy, siliceous, thermic Arenic Plinthic Paleudults.

Typical pedon of Lilbert loamy fine sand, 1 to 5 percent slopes; in timber, northwest of Lufkin; from intersection of Texas Highway 103 and Loop 287, 6.5 miles northwest to St. Regis Work Center, 0.6 mile north on a dirt road, and 20 feet west of Newman Cemetery. This pedon is on map sheet 10.

A—0 to 7 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak medium granular structure; soft, very friable; many very fine and fine roots; medium acid; clear smooth boundary.

E1—7 to 12 inches; brown (10YR 5/3) loamy fine sand; single grained; soft, very friable; many fine roots; medium acid; clear smooth boundary.

E2—12 to 31 inches; pale brown (10YR 6/3) loamy fine sand; single grained; soft, very friable; common fine and very fine roots; strongly acid; clear smooth boundary.

Bt1—31 to 39 inches; strong brown (7.5YR 5/8) sandy clay loam; weak medium subangular blocky structure; slightly hard, friable; few fine roots; few thin yellowish brown (10YR 5/6) clay films; very strongly acid; gradual smooth boundary.

Bt2—39 to 54 inches; strong brown (7.5YR 5/8) sandy clay loam; common medium distinct red (2.5YR 4/6) and light gray (10YR 6/1) mottles; weak medium subangular blocky structure; slightly hard, friable;

few fine roots; 2 to 3 percent plinthite; very strongly acid; gradual smooth boundary.

Bt3—54 to 65 inches; strong brown (7.5YR 5/8) sandy clay loam; common medium distinct reticulate mottles of red (2.5YR 4/6) and light gray (10YR 6/1); weak medium subangular blocky structure; slightly hard; few fine roots; 7 to 8 percent plinthite; many yellowish brown clay films; very strongly acid.

The thickness of the solum ranges from 60 to 80 inches. Plinthite content ranges from 5 to 20 percent at a depth of 30 to 60 inches. Base saturation ranges from 20 to 35 percent at a depth of 72 inches.

The combined thickness of the A and E horizons is 20 to 40 inches. The A horizon is very dark gray, dark gray, dark grayish brown, dark brown, grayish brown, or brown. Reaction ranges from very strongly acid to slightly acid. The E horizon is brown, yellowish brown, pale brown, light yellowish brown, or very pale brown.

The Bt horizon is strong brown, yellowish brown, brownish yellow, yellowish red, or reddish yellow. Dark red, red, and yellowish red mottles are few to common throughout the horizon. Clay content of the upper 20 inches ranges from 24 to 32 percent, but it ranges from 20 to 35 percent in the lower layers. Light gray, light brownish gray, pale brown, and very pale brown mottles are in the lower part of the Bt horizon in most pedons. Reaction ranges from very strongly acid to medium acid.

Some pedons have a C horizon that is loamy and sandy coastal plain sediment.

Mantachie Series

The Mantachie series consists of deep, loamy, somewhat poorly drained soils on bottom lands. Permeability is moderate. Slopes are less than 1 percent. These soils are subject to flooding most years late in winter and early in spring.

Soils of the Mantachie series are fine-loamy, siliceous, acid, thermic Aeric Fluvaquents.

Typical pedon of Mantachie clay loam, frequently flooded; about 1,200 feet north of Texas Highway 7, 150 feet east of fence, in Angelina River bottom 450 feet west of river channel. This pedon is on map sheet 2.

A—0 to 5 inches; grayish brown (10YR 5/2) clay loam; weak medium granular structure; friable, hard; many fine roots; strongly acid; clear smooth boundary.

Bw—5 to 10 inches; mottled light gray (10YR 6/1) and yellowish red (5YR 5/8) clay loam; weak medium subangular blocky structure; friable, hard; few worm casts; many roots of all sizes; strongly acid; gradual smooth boundary.

Bg1—10 to 30 inches; light gray (10YR 6/1) clay loam; common medium prominent strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; firm, hard; strongly acid; clear smooth boundary.

Bg2—30 to 40 inches; mottled grayish brown (10YR 5/2) and light gray (10YR 7/2) clay loam; weak medium subangular blocky structure; friable, hard; few fine brown concretions; few medium and large roots; few worm casts; very strongly acid; gradual smooth boundary.

Cg—40 to 60 inches; gray (10YR 5/1) clay; massive; firm, hard; few salts in the lower part; strongly acid.

The A horizon is dark brown, very dark grayish brown, grayish brown, dark grayish brown, brown, dark yellowish brown, or yellowish brown, or it is mottled in shades of brown and gray.

The Bw horizon is mottled in shades of gray, red, brown, and yellow, or it is grayish brown, brown, or yellowish brown and has few to many grayish mottles.

The Bg horizon is grayish brown, gray, light gray, or light brownish gray and has few to many mottles in shades of brown and red. The B horizon is clay loam, loam, or sandy clay loam. Average clay content of the 10- to 40-inch control section ranges from 18 to 32 percent.

Reaction is strongly acid or very strongly acid throughout.

These soils are taxadjuncts to the Mantachie series because they have a C horizon that has clay texture, which is outside the range of the series. The use, management, and behavior are not affected by this difference.

Marietta Series

The Marietta series consists of deep, loamy, moderately well drained soils on bottom lands. Permeability is moderate. These soils formed in material deposited on flood plains. Slopes are less than 1 percent. These soils are subject to flooding late in winter and early in spring.

Soils of the Marietta series are fine-loamy, siliceous, thermic Fluvaquentic Eutrochrepts.

Typical pedon of Marietta fine sandy loam, frequently flooded; in Procella Creek bottom, west of Farm Road 2125, and south of the creek. This pedon is on map sheet 6.

A1—0 to 5 inches; brown (10YR 5/3) fine sandy loam; weak medium granular structure; friable, slightly hard; many fine roots; medium acid; clear wavy boundary.

A2—5 to 10 inches; dark brown (10YR 4/3) fine sandy loam; common medium faint dark grayish brown (10YR 4/2) mottles; weak medium granular structure; friable, soft; many fine roots; medium acid; abrupt wavy boundary.

Bw1—10 to 20 inches; mottled dark brown (10YR 4/3) and light brownish gray (10YR 6/2) loam; weak medium subangular blocky structure; many fine

roots; friable, slightly hard; medium acid; gradual wavy boundary.

Bw2—20 to 30 inches; mottled light brownish gray (10YR 6/2) and dark brown (7.5YR 4/4) sandy clay loam; weak medium subangular blocky structure; friable, slightly hard; few soft concretions of iron and manganese; medium acid; gradual boundary.

Bw3—30 to 60 inches; mottled light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) sandy clay loam; light gray (10YR 6/1) stripped areas; massive; friable, moist; medium acid.

The A horizon is dark grayish brown, grayish brown, dark brown, brown, yellowish brown, very dark grayish brown, or dark brown.

The Bw1 horizon is dark brown, brown, olive brown, or dark yellowish brown. Grayish mottles are few to common. The Bw2 horizon has colors similar to those of the Bw1 horizon, or it is mottled in shades of gray, brown, and yellow. The Bw3 horizon is gray, grayish brown, or light brownish gray, or it is mottled in shades of gray, yellow, and brown. The Bw horizon is clay loam, sandy clay loam, or loam. Clay content of the 10- to 40-inch control section ranges from 18 to 30 percent. Few to common black and brown concretions are in the lower part of the Bw horizon and in the C horizon.

Some pedons have a C horizon that is clay loam, silty clay loam, or silt loam. It has the same color range as the Bw3 horizon.

Reaction ranges from medium acid to mildly alkaline throughout.

Melhomes Series

The Melhomes series consists of deep, poorly drained, rapidly permeable soils on uplands. These soils formed in thick, sandy deposits. Slope ranges from 0 to 5 percent.

Soils of the Melhomes series are siliceous, thermic Humaqueptic Psammaquents.

Typical profile of Melhomes loamy sand, frequently flooded; in timber, about 0.5 mile north of Jasper County line on Texas Highway 63, 1 mile east on county road, 100 feet north of road. This pedon is on map sheet 45.

O—2 inches to 0; partly decomposed forest litter.

A1—0 to 5 inches; dark gray (10YR 4/1) and very dark gray (10YR 3/1) loamy sand; weak medium granular structure; soft, friable; many fine roots; very strongly acid; clear wavy boundary.

A2—5 to 9 inches; dark gray (10YR 4/1) and dark grayish brown (10YR 4/2) loamy sand; single grained; loose; many fine roots; very strongly acid; gradual wavy boundary.

Cg—9 to 65 inches; light gray (10YR 7/1) loamy sand; single grained; very strongly acid.

This soil is loamy sand or sand between a depth of 9 and 80 inches.

The thickness of the A horizon ranges from 6 to 10 inches. It is black, very dark gray, dark grayish brown, or dark gray.

The C horizon is light gray or white.

Reaction is very strongly acid or strongly acid throughout.

Mollville Series

The Mollville series consists of deep, loamy, poorly drained soils in depressions on terraces. Permeability is slow. These soils formed in stratified sediment in ancient backwater sloughs. They have been modified by the wind. Slopes are less than 1 percent.

Soils of the Mollville series are fine-loamy, mixed, thermic Typic Glossaqualfs.

Typical pedon of Mollville loam in an area of Mollville-Besner complex, gently undulating; in timber, about 2.3 miles west on Farm Road 1818 from intersection with Farm Road 844, 1.4 miles south of Farm Road 1818 on Renfro Cemetery Road, and 75 feet east. This pedon is on map sheet 35.

A—0 to 5 inches; dark gray (10YR 4/1) loam; weak fine subangular blocky and granular structure; hard, friable; many roots of all sizes; many fine pores; very strongly acid; clear wavy boundary.

Eg—5 to 10 inches; light brownish gray (10YR 6/2) loam, structureless but porous; hard, friable; common roots of all sizes; common fine pores; strongly acid; clear wavy boundary.

Btg/E1—10 to 20 inches; grayish brown (10YR 5/2) clay loam, common medium distinct strong brown (7.5YR 5/6) mottles; light gray (10YR 6/1) tongues of loam; very hard, friable; common medium tree roots; strongly acid; gradual irregular boundary.

Btg/E2—20 to 43 inches; gray (10YR 5/1) clay loam; strong brown (7.5YR 5/6) mottles; light gray (10YR 6/1) tongues and ped coats of loam penetrating from Btg/E1 in ped interiors; weak coarse columnar structure parting to moderate medium subangular blocky; very hard, firm; few medium tree roots; strongly acid; gradual wavy boundary.

Btg—43 to 55 inches; light brownish gray (10YR 6/1) and grayish brown (10YR 5/2) clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; hard, firm; strongly acid; gradual wavy boundary.

C—55 to 65 inches; light gray (10YR 6/1) sandy clay loam; massive; medium acid.

The thickness of the solum is 40 to about 70 inches.

The combined thickness of the A and E horizons ranges from 8 to 18 inches. The A horizon is very dark grayish brown, dark gray, gray, grayish brown, or dark

grayish brown. The Eg horizon is light gray, light brownish gray, or grayish brown. Tongues or streaks of E material 0.5 inch to 4.0 inches wide extend through the Btg/E1 horizon and, in some pedons, through the Btg/E2 horizon. Reaction ranges from very strongly acid to medium acid.

The Btg/E1 horizon is light brownish gray or grayish brown. Ped exteriors are coated with dark grayish brown or very dark grayish brown. The Btg/E2 and Btg horizons are gray, light gray, light brownish gray, or grayish brown. Strong brown and yellowish red mottles in these horizons range from few to many. These horizons are clay loam or sandy clay loam. The clay content averages between 22 and 35 percent. Twenty to about 40 percent is sand that is coarser than very fine sand. In the Btg/E horizons, reaction is very strongly acid to medium acid. In the Btg horizon, reaction is strongly acid to mildly alkaline. Exchangeable sodium ranges from 2 to 12 percent.

The C horizon is grayish sandy clay loam or clay loam. Reaction ranges from medium acid to mildly alkaline.

Moswell Series

The Moswell series consists of deep, moderately well drained, very slowly permeable soils on uplands. These soils formed from shale, clay, or soft mudstone deposits mainly in the Manning, Caddell, and Yegua Formations. These soils are on broad interstream divides. Slopes range from 1 to 15 percent.

Soils of the Moswell series are very-fine, montmorillonitic, thermic Vertic Hapludalfs.

Typical pedon of Moswell loam, 1 to 5 percent slopes; about 15 miles south of Lufkin from intersection of Farm Road 1818 at Flournoy Crossing, 2 miles west on Farm Road 1818, 0.6 mile south on logging road, and 20 feet west of road. This pedon is on map sheet 35.

A—0 to 2 inches; dark grayish brown (10YR 4/2) loam; weak medium granular structure; soft, friable, nonplastic; many coarse and medium roots; medium acid; clear smooth boundary.

E—2 to 5 inches; pale brown (10YR 6/3) loam; massive but porous; soft, friable, nonplastic; many medium roots; very strongly acid; clear wavy boundary.

Bt1—5 to 12 inches; red (2.5YR 4/8) clay; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; very hard, very firm, very plastic; many medium and fine roots; very strongly acid; gradual very wavy boundary.

Bt2—12 to 23 inches; distinctly mottled grayish brown (10YR 5/2) and yellowish red (5YR 5/8) clay; weak medium subangular blocky structure; very hard, very firm, very plastic; many fine roots; extremely acid; gradual wavy boundary.

Bty1—23 to 31 inches; yellowish red (5YR 5/8) clay; distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very hard, very firm, very plastic; few fine roots; occasional gypsum crystals in lower part; extremely acid; gradual wavy boundary.

Bty2—31 to 37 inches; grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) clay; weak subangular blocky to platy structure; thin layer of red (2.5YR 5/8); very hard, firm, plastic; few fine roots; about 40 percent, by volume, gypsum crystals; extremely acid; gradual wavy boundary.

BCy—37 to 45 inches; grayish brown (2.5Y 5/2), light brownish gray (2.5Y 6/2), and light yellowish brown (2.5Y 6/4) platy clay; very hard, firm, plastic; few fine roots; olive yellow streaks; about 40 percent, by volume, gypsum crystals and white barite spots; extremely acid; gradual wavy boundary.

Cy1—45 to 57 inches; alternate layers of olive (5Y 5/3) and pale yellow (5Y 7/3) shale; occasional thin layer of shale in shades of red; thin clean silt layer on few peds; gypsum and white barite spots on most layers; dark grayish brown (10YR 4/2) clay films in thin cracks; few flattened roots between shale layers; extremely acid; gradual smooth boundary.

Cy2—57 to 70 inches; alternate layers of olive (5Y 5/3) and pale yellow (5Y 7/3) shale; some fragments coated with gypsum; thin black iron-manganese layers coating faces of some shale fragments; few thin sheets of jarosite and natrojarosite that have white spots of barite and calcite; extremely acid.

The thickness of the solum ranges from 40 to 60 inches.

The A horizon ranges from 2 to 10 inches thick. It is very dark grayish brown, dark grayish brown, dark brown, or brown. Reaction ranges from medium acid to very strongly acid.

The E horizon is pale brown, light brown, light brownish gray, or brown.

The Bt horizon is red or yellowish red, or it is red or yellowish red that is distinctly mottled with grayish brown or light brownish gray, or it is distinctly mottled with all of these colors. Electricity conductivity is less than 2.0 mmhos/cm. Aluminum saturation ranges from 30 to 50 percent. Reaction ranges from strongly acid to extremely acid.

The Bty and BCy horizons are dominantly grayish brown, light brownish gray, or light gray mottled with red, yellowish red, strong brown, yellowish brown, or light yellowish brown. Electricity conductivity is 2.0 to 8.0 mmhos/cm. Gypsum and barite are common to abundant. Exchangeable sodium percentage ranges from 8 to 13 percent. Reaction is very strongly acid or extremely acid.

The Cy horizon is olive, pale yellow, or yellow. It is shale, clay, or soft mudstone. Gypsum, barite, and jarosite are in most pedons, and some contain calcite

and natrojarosite. Reaction ranges from extremely acid to strongly acid.

Moten Series

The Moten series consists of deep, somewhat poorly drained, slowly permeable soils in intermounds areas on terraces. These nearly level soils formed in loamy and silty sediment partly reworked by the wind. A perched water table is 6 to 18 inches below the surface during the cool season. Slopes are less than 1 percent.

Soils of the Moten series are coarse-loamy, siliceous, thermic Aeric Glossaqualfs.

Typical pedon of Moten silt loam in an area of Moten-Multey complex, gently undulating; about 1 mile south of Diboll and 2.5 miles east on a logging road. This pedon is on map sheet 33.

A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; soft, friable, slightly sticky and slightly plastic; common fine and medium roots; medium acid; clear smooth boundary.

E1—4 to 9 inches; grayish brown (10YR 5/2) silt loam; massive but porous; soft, friable, slightly sticky and slightly plastic; common roots of all sizes; medium acid; gradual wavy boundary.

E2—9 to 26 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) stains along root channels; masssive but porous; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; strongly acid; clear wavy boundary.

Bt/E1—26 to 46 inches; dark grayish brown (10YR 4/2) silt loam; tongues of light brownish gray (10YR 6/2); weak prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine roots; very strongly acid; clear wavy boundary.

Bt/E2—46 to 52 inches; dark grayish brown (10YR 4/2) silt loam; common medium distinct reddish yellow (7.5YR 6/8) mottles; light brownish gray (10YR 6/2) vertical tongues and few very dark brown (10YR 3/2) streaks; weak prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; very strongly acid; clear wavy boundary.

C—52 to 65 inches; dark grayish brown (10YR 5/2) clay loam; pockets of silt loam; massive; very strongly acid.

The thickness of the solum ranges from 60 to 80 inches.

The combined thickness of the A and E horizons is 22 to 35 inches. The A horizon is dark grayish brown or very dark grayish brown. The E horizon is grayish brown or light brownish gray. Reaction is very strongly acid to medium acid.

The Bt/E horizon is loam or silt loam in the upper part and ranges from silty clay loam to clay loam in the lower part of some pedons. The Bt part is light brownish gray, grayish brown, or dark grayish brown that has reddish yellow, strong brown, or yellowish brown mottles. The E part is light brownish gray or light gray. The clay content of the upper 20 inches of the argillic horizon ranges from 12 to 18 percent, and the silt content is 30 to 55 percent. Reaction of the Bt/E horizon ranges from very strongly acid to neutral.

Multey Series

The Multey series consists of deep, moderately well drained soils. Permeability is moderate. These soils formed in old alluvial sediment that has been modified by wind. They are on broad terraces that have mounded landscapes. A perched water table is about 36 inches below the surface late in winter and early in spring. Slopes are less than 2 percent.

Soils of the Multey series are coarse-loamy, siliceous, thermic Aquic Glossudalfs.

Typical pedon of Multey fine sandy loam in an area of Moten-Multey complex, gently undulating; 1.0 mile south of Diboll, 2.5 miles east on a logging road, and 150 feet north, on a mound. This pedon is on map sheet 33.

A—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak medium granular structure; soft, friable; many fine and medium roots; slightly acid; clear smooth boundary.

E1—5 to 18 inches; brown (10YR 5/3) fine sandy loam; massive but porous; slightly hard, friable; many fine roots; strongly acid; gradual wavy boundary.

E2—18 to 25 inches; pale brown (10YR 6/3) fine sandy loam; few fine faint brownish yellow (10YR 6/6) stains along root channels; massive but porous; slightly hard, friable; few fine grass roots; strongly acid; gradual wavy boundary.

E/Bt—25 to 38 inches; pale brown (10YR 6/3) fine sandy loam that has Bt bodies of yellowish brown (10YR 5/6) loam; light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; slightly hard, friable; few fine grass roots; few clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt/E1—38 to 47 inches; yellowish brown (10YR 5/6) loam that has tongues of grayish brown (10YR 5/2) E material 2 to 8 cm wide; few clay films on faces of peds, few fine distinct red (2.5YR 4/8) mottles in interior of peds; weak medium subangular blocky structure; hard, friable; very strongly acid; clear smooth boundary.

Bt/E2—47 to 65 inches; yellowish brown (10YR 5/6) loam; common medium distinct red (2.5YR 4/8) mottles penetrated by light gray (10YR 6/1) tongues; moderate medium blocky structure; hard,

friable; few clay films on faces of peds; strongly acid; clear smooth boundary.

BC—65 to 70 inches; grayish brown (10YR 5/2) fine sandy loam; weak prismatic structure; hard, friable; strongly acid.

The thickness of the solum ranges from 60 to 80 inches.

The combined thickness of the A and E horizons ranges from 20 to 36 inches. The A horizon is brown or dark grayish brown. Reaction ranges from strongly acid to slightly acid. The E horizon is pale brown or brown. Some brownish yellow or yellowish brown stains or mottles are in the lower part of some pedons. Reaction is very strongly acid or strongly acid.

The E/Bt or the Bt/E horizons are fine sandy loam, very fine sandy loam, or loam in the upper part. High chroma colors of the Bt part of the matrix are yellowish brown or strong brown and have red or yellowish red mottles. Low chroma colors are light gray or light brownish gray. The E part of the matrix is light gray or light brownish gray. Weighted average clay content of the upper 20 inches of the Bt horizon ranges from 10 to 18 percent, and silt content generally exceeds 25 percent. Reaction in these horizons is very strongly acid or strongly acid.

The lower part of the Bt/E horizon is fine sandy loam, very fine sandy loam, loam, or sandy clay loam. The major colors are the same as above but some pedons have areas of darker colors immediately above the C horizon.

The underlying material is variable to stratified but is generally loamy. Reaction ranges from very strongly acid to moderately alkaline.

Naclina Series

The Naclina series consists of deep, very slowly permeable, somewhat poorly drained soils. Permeability is very slow. These soils formed in calcareous, clayey marine sediment mainly in the Cook Mountain, Yegua, and Caddell Formations. Slope is 5 to 15 percent.

Soils of the Naclina series are fine, montmorillonitic, thermic Aquentic Chromuderts.

Typical pedon of Naclina clay, 5 to 15 percent slopes; from Texas Highway 103, 4.0 miles north and east on Farm Road 842 to Moffit Church, 1.5 miles north on unpaved road and 50 feet west, 600 feet west of Tom Creek channel. This pedon is on map sheet 7.

A—0 to 3 inches; dark brown (10YR 3/3) clay; moderate medium granular structure; very firm, very hard, very plastic and sticky; many medium and coarse roots; neutral; clear wavy boundary.

Bw1—3 to 14 inches; yellowish red (5YR 5/8) clay; moderate medium granular structure; very firm, very hard, very plastic and sticky; many medium roots; mildly alkaline; gradual wavy boundary.

Bw2—14 to 30 inches; yellowish red (5YR 5/8) clay; few fine distinct dark grayish brown (10YR 4/2) mottles; weak medium subangular blocky structure; very firm, very hard, very plastic and sticky; few fine and medium roots; common pressure faces; moderately alkaline and calcareous; gradual smooth boundary.

Bw3—30 to 45 inches; distinctly mottled light olive brown (2.5Y 5/4) and grayish brown (2.5Y 5/2) clay; weak medium subangular blocky structure; firm, hard, plastic and sticky; few fine roots; common slickensides; moderately alkaline and calcareous; clear smooth boundary.

C—45 to 60 inches; laminated strong brown (7.5YR 5/6) and grayish brown (2.5Y 5/2) clayey material; few large slickensides; moderately alkaline and calcareous.

The thickness of the solum ranges from 35 to 60 inches. Depth to the horizon that has slickensides ranges from 15 to 36 inches, and depth to calcareous material ranges from 10 to 40 inches. Gilgai microrelief ranges from 8 to 15 feet from microridges to microvalleys that are perpendicular to the slope contour. Microridges are about 4 to 10 inches high.

The A horizon ranges from 1 to 12 inches thick. It is very dark grayish brown, dark grayish brown, dark brown, or brown. Some pedons have an A2 horizon that is reddish brown, brown, dark brown, dark grayish brown, or very dark grayish brown. In some pedons, the A2 horizon has a few mottles. The extremes of amplitude, or waviness, between the A and the Bw horizons range from 4 to 24 inches. Reaction ranges from strongly acid to neutral.

The upper part of the Bw horizon is reddish brown, red, yellowish red, or strong brown and has mottles of yellowish brown, gray, light brownish gray, grayish brown, and dark grayish brown. Reaction ranges from strongly acid to moderately alkaline. The lower part of the Bw horizon is light olive brown, olive brown, olive, or olive yellow. It has mottles of yellowish brown, strong brown, or light brownish gray. Reaction ranges from neutral to moderately alkaline.

The C horizon is laminated calcareous clay, marl, or shale.

Ozias Series

The Ozias series consists of deep, somewhat poorly drained soils on bottom lands. Permeability is very slow. These soils formed in clayey acid alluvium. The soils are subject to flooding most years in winter and in spring. Slopes are generally less than 1 percent.

Soils of the Ozias series are fine, montmorillonitic, acid, thermic Aeric Fluvaquents.

Typical pedon of Ozias silty clay, frequently flooded; about 20 miles south of Lufkin in confluence of Shawnee

Creek bottom and Neches River bottom, 0.4 mile north of Jasper County line. This pedon is on map sheet 47.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) silty clay; moderate medium granular structure; very firm, very hard; many roots of all sizes; electrical conductivity 0.3; extremely acid; clear smooth boundary.

A2—5 to 10 inches; dark gray (10YR 4/1) silty clay; moderate medium blocky structure; very firm, very hard; many roots of all sizes; electrical conductivity 0.6; extremely acid; clear smooth boundary.

Bg1—10 to 18 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct strong brown (7.5YR 5/6) stains; moderate medium blocky structure; firm, hard; common tree roots; electrical conductivity 2.8; extremely acid; clear smooth boundary.

Bg2—18 to 44 inches; dark gray (10YR 4/1) silty clay; common medium distinct strong brown (7.5YR 5/6) stains along root channels; weak medium subangular blocky structure; firm, hard; common fine roots; few white salt crystals; electrical conductivity 6.3; extremely acid; clear smooth boundary.

Cg1—44 to 61 inches; grayish brown (10YR 5/2) silty clay; common medium distinct yellowish red (5YR 5/8) stains; massive; firm, hard; few fine roots; electrical conductivity 5.3; extremely acid; abrupt smooth boundary.

Cg2—61 to 80 inches; dark gray (10YR 4/1) silty clay loam; massive but porous; saturated; no roots; electrical conductivity 7.1; mildly alkaline.

The A horizon is gray, dark gray, dark grayish brown, very dark gray, grayish brown, and brown. It is 3 to 15 inches thick.

The Bg horizon is clay, silty clay, or silty clay loam that has mottles in shades of red, yellow, or brown. Low chroma colors are dark gray, gray, light gray, grayish brown, and light brownish gray.

The Cg horizon is the same color as the Bg horizon. Texture is also the same, but thinner loamy strata are in places.

In wooded areas, the electrical conductivity is typically less than 4 mmhos/cm in the upper 40 inches. In cleared areas and pastures, the reading ranges from 2 to 16 mmhos/cm except in local hot spots, which are higher. Reaction throughout the upper 40 inches of the profile is extremely acid or very strongly acid. In the lower part of the profile, generally below 40 inches, the electrical conductivity is typically 2 to 10 mmhos/cm but can read as high as 16. The lower part of the profile ranges from extremely acid to moderately alkaline depending on the form of the salts. The Bg and Cg horizons contain salts in most pedons.

Pophers Series

The Pophers series consists of deep, slowly permeable, somewhat poorly drained soils on bottom lands. These soils formed in loamy and silty alluvium. They are subject to flooding mainly in winter and spring. Slopes are generally less than 1 percent.

Soils of the Pophers series are fine-silty, siliceous, acid, thermic Aeric Fluvaquents.

Typical pedon of Pophers silty clay loam, frequently flooded; in woodland, about 15 miles south of Lufkin, about 1.5 miles east of DuBose Store on Farm Road 1818 from intersection with Farm Road 58; into Biloxi Creek bottom, and 100 feet north. This pedon is on map sheet 34.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) silty clay loam; moderate medium granular structure; very firm, very hard; many roots of all sizes; electrical conductivity 0.3; extremely acid; clear smooth boundary.

A2—4 to 10 inches; dark brown (10YR 4/3) silty clay loam; common medium faint grayish brown (10YR 5/2) mottles; common medium distinct yellowish red (5YR 5/8) stains along root channels; weak medium granular structure; firm, hard; many roots of all sizes; electrical conductivity 0.3; extremely acid; clear smooth boundary.

Bg1—10 to 24 inches; grayish brown (10YR 5/2) silty clay loam; many medium faint brown (10YR 5/3) mottles; weak medium subangular blocky structure; firm, hard; common medium and fine roots; electrical conductivity 0.2; extremely acid; clear smooth boundary.

Bg2—24 to 46 inches; light gray (10YR 6/1) silty clay loam; common dark grayish brown (10YR 4/2) streaks or clay cups and common medium distinct yellowish red (5YR 5/8) stains along root channels; weak medium subangular blocky structure; firm, hard; common medium and fine roots; electrical conductivity 2.0; extremely acid; abrupt smooth boundary.

Cg1—46 to 65 inches; dark grayish brown (10YR 4/2) silty clay loam; few medium distinct yellowish red (5YR 5/8) stains; firm, hard; massive but porous; few fine roots; electrical conductivity 6.2; extremely acid; clear smooth boundary.

Cg2—65 to 80 inches; very dark grayish brown (2.5Y 3/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; very firm, very hard; few salt crystals, some of which are gypsum and barite; electrical conductivity 9.3; extremely acid.

The A horizon is dark brown, brown, grayish brown, or dark grayish brown. It is 2 to 15 inches thick.

The Bg horizon is clay loam, silty clay loam, or loam. Low chroma colors are gray, dark gray, grayish brown,

light brownish gray, and light gray. High chroma mottles and stains are red, yellowish red, strong brown, or yellowish brown.

The Cg horizon or old buried horizons are silty clay loam, silty clay, clay loam, or loam. Colors are similar to those of the Bg horizon. Crystals of gypsum and other salts are in most pedons.

In wooded areas, the electrical conductivity reading is typically less than 4 mmhos/cm in the upper 40 inches. In cleared areas and pastures, the reading is typically less than 16 but in local hot spots may be considerably higher. In the lower part of the profile, below 40 inches, the electrical conductivity is generally 4 to 10 mmhos/cm but ranges to 16. Reaction throughout the profile ranges from extremely acid to medium acid.

Rayburn Series

The Rayburn series consists of deep, loamy, moderately well drained soils on uplands. Permeability is very slow. These soils formed in acid, tuffaceous material mainly in the Catahoula Formation. Slopes range from 1 to 15 percent.

Soils of the Rayburn series are fine, montmorillonitic, thermic Vertic Hapludalfs.

Typical pedon of Rayburn fine sandy loam, 1 to 5 percent slopes; about 1.8 miles north on U.S. Highway 69 from Jasper County line, 1.5 miles west of U.S. Highway 69, 10 feet south of Kitchen Cemetery road. This pedon is on map sheet 48.

A—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak medium granular structure; friable, soft; common fine roots; strongly acid; clear smooth boundary.

E—4 to 8 inches; grayish brown (10YR 5/2) fine sandy loam; friable, soft; common fine roots; strongly acid; abrupt smooth boundary.

Bt1—8 to 12 inches; red (2.5YR 4/6) clay; moderate medium angular blocky structure; very firm, extremely hard, very plastic and sticky; few 1- to 2-inch pressure faces; few clay films on faces of peds; common fine roots; very strongly acid; gradual smooth boundary.

Bt2—12 to 21 inches; red (2.5YR 4/6) clay; common medium distinct grayish brown (10YR 5/2) mottles; weak medium fine angular blocky structure; very firm, extremely hard, very plastic and sticky; few small pressure faces; few clay films on faces of peds; common fine roots; very strongly acid; gradual smooth boundary.

Bt3—21 to 30 inches; mottled light brownish gray (10YR 6/2) and red (2.5YR 4/6) clay; moderate fine and medium angular blocky structure; very firm, extremely hard, very plastic and sticky; few small pressure faces; few clay films on faces of peds; few fine roots; very strongly acid; gradual wavy boundary.

Bt4—30 to 50 inches; light brownish gray (10YR 6/2) clay; common medium distinct strong brown (7.5YR 5/6) mottles; weak fine angular blocky structure; firm, hard, plastic and sticky; few small pressure faces and slickensides; few apparent clay films on faces of peds; few fine roots; very strongly acid; gradual smooth boundary.

Cr—50 to 60 inches; light gray (2.5Y 7/2) weakly consolidated tuffaceous material; few medium distinct olive yellow (2.5Y 6/8) mottles; massive; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches. Base saturation at the paralithic contact is 35 to 60 percent. The COLE is 0.09 to 0.14 in the Bt horizon.

The combined thickness of the A and E horizons ranges from 4 to 15 inches. The A horizon is dark grayish brown, very dark grayish brown, very dark brown, brown, or dark brown. The E horizon is pale brown, grayish brown, or brown. Some pedons do not have an E horizon. Reaction ranges from medium acid to very strongly acid.

The upper part of the Bt horizon is reddish brown, yellowish red, or red. A few mottles of light brownish gray or grayish brown are in most pedons. The lower part of the Bt horizon is mostly light brownish gray, light olive gray, or pale olive and has common prominent mottles of red, reddish brown, yellowish red, or strong brown. The Bt horizon is clay or silty clay. Clay content of the upper 20 inches averages between 40 and 60 percent, but the Bt1 horizon can contain up to 70 percent clay. Reaction ranges from extremely acid to strongly acid.

The Cr horizon is mostly weakly consolidated tuffaceous sandstone that is bentonitic but contains volcanic ash, volcanic glass, and other pyroclastic materials. Reaction ranges from extremely acid to medium acid.

Raylake Series

The Raylake series consists of deep, somewhat poorly drained soils that formed in thick, clayey marine sediment. Permeability is very slow. These soils are on broad, nearly level and gently sloping interstream divides mainly in the Manning, Caddell, and Yegua Formations. Slopes range from 0 to 4 percent.

Soils of the Raylake series are fine, montmorillonitic, thermic Aquentic Chromuderts.

Typical pedon of Raylake clay loam, 0 to 4 percent slopes; about 1.6 miles south on Farm Road 844 from intersection with Farm Road 1818, 100 feet west, in wooded area. This pedon is on map sheet 35.

A—0 to 4 inches; dark grayish brown (10YR 4/2) clay loam; weak medium granular structure; slightly hard, friable; many medium and few coarse roots;

common fine and few medium vesicular pores; strongly acid; abrupt wavy boundary.

Bw1—4 to 11 inches; distinctly mottled red (2.5YR 4/8) and light brownish gray (10YR 6/2) clay; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, very firm, sticky and plastic; common medium and few coarse roots; very strongly acid; gradual wavy boundary.

Bw2—11 to 43 inches; light brownish gray (10YR 6/2) clay; common medium prominent yellowish red (5YR 5/8) mottles; weak coarse prismatic structure parting to weak medium angular blocky; very hard, very firm, sticky and plastic; common few fine and medium roots; common intersecting slickensides 5 to 50 cm across below 20 inches; few gypsum crystals; electrical conductivity 2.1 mmhos/cm; very strongly acid; gradual wavy boundary.

By—43 to 51 inches; light brownish gray (10YR 6/2) clay; common medium prominent yellowish red (5YR 5/8) mottles and spots of light yellowish brown (2.5Y 6/4) shale; weak medium subangular blocky structure; very hard, very firm, sticky and plastic; few fine roots mainly between peds; few large slickensides; common gypsum crystals; electrical conductivity 5.1 mmhos/cm; very strongly acid; gradual wavy boundary.

Cy—51 to 65 inches; plates of light yellowish brown (2.5Y 6/4) and light brownish gray (10YR 6/2) shaly clay; very hard, very firm; common gypsum crystals; electrical conductivity 5.5 mmhos/cm; medium acid.

The thickness of the solum ranges from 40 to 60 inches. Gilgai relief consists of 8 to 12 feet between center of microknolls to center of microdepression, with microridges being 4 to 16 inches above the microvalleys. Depth to intersecting slickensides ranges from 17 to 30 inches. The extremes of amplitude, or waviness, between the Bw1 and Bw2 horizons range from 6 to 20 inches.

The thickness of the A horizon ranges from less than 1 inch on the microridge to 8 inches in the microvalley. The A horizon is very dark grayish brown, very dark gray, dark grayish brown, dark gray, or dark brown. Reaction is strongly acid or medium acid. The electrical conductivity is less than 1.0 mmhos/cm.

The Bw1 horizon is mainly clay or silty clay. High chroma colors are yellowish brown, strong brown, yellowish red, or red, and low chroma colors are light brownish gray, grayish brown, or gray. Reaction ranges from extremely acid to medium acid. The electrical conductivity is less than 2.0 mmhos/cm.

The Bw2 and By horizons are light brownish gray, grayish brown, light olive brown, or light yellowish brown. They have gray, strong brown, yellowish red, olive yellow, or olive mottles. Reaction ranges from very strongly acid to neutral. The electrical conductivity ranges from 1 to 4 mmhos/cm.

The Cy horizon is layered clay, marl, or shale. Reaction ranges from very strongly acid to moderately alkaline. The electrical conductivity is 2 to 8 mmhos/cm.

Rentzel Series

The Rentzel series consists of deep, sandy, somewhat poorly drained soils on uplands. Permeability is moderately slow. These soils formed in sandy coastal plain sediment. Slopes range from 0 to 4 percent.

Soils of the Rentzel series are loamy, siliceous, thermic Arenic Plinthaquic Paleudults.

Typical pedon of Rentzel loamy fine sand, 0 to 4 percent slopes; from intersection of U.S. Highway 69 and Farm Road 2021, 1.6 miles east on Farm Road 2021, about 0.5 mile north of KLUF radio tower, 20 feet east of road. This pedon is on map sheet 6.

A—0 to 7 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak medium subangular blocky structure; soft, very friable; many fine and medium roots; strongly acid; clear wavy boundary.

E—7 to 24 inches; pale brown (10YR 6/3) loamy fine sand; common medium faint light brownish gray (10YR 6/2) mottles in lower part; weak medium subangular blocky structure; soft, very friable; many fine and medium roots; strongly acid; clear wavy boundary.

Bt1—24 to 30 inches; strong brown (7.5YR 5/8) sandy clay loam; many medium distinct light brownish gray (10YR 6/2) and yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; hard, friable; few fine and medium roots; few thin clay films; strongly acid; gradual wavy boundary.

Bt2—30 to 45 inches; reticulately mottled strong brown (7.5YR 5/6), light brownish gray (10YR 6/2), and yellowish red (5YR 5/8) sandy clay loam; weak medium subangular blocky structure; very hard, firm; few fine roots; 10 percent, by volume, plinthite; few patchy clay films; strongly acid; gradual wavy boundary.

Bt3—45 to 60 inches; light brownish gray (10YR 6/2) sandy clay loam; many coarse prominent strong brown (7.5YR 5/6) and red (2.5YR 4/8) mottles; moderate medium prismatic structure; very hard, firm; few fine roots; 9 percent, by volume, plinthite; about 10 percent, by volume, brittle bodies; very strongly acid.

The thickness of the solum ranges from 65 to more than 80 inches. Plinthite content, by volume, ranges from 5 to 20 percent in the Bt horizon. Base saturation at a depth of 72 inches ranges from 15 to 35 percent.

The combined thickness of the A and E horizons ranges from 20 to 40 inches. Reaction ranges from slightly acid to strongly acid. The A horizon is grayish brown, dark grayish brown, very dark grayish brown,

brown, or dark brown. The E horizon is light gray, light brownish gray, very pale brown, pale brown, brown, or light yellowish brown.

The Bt horizon is fine sandy loam or sandy clay loam. It is mainly high chroma colors mottled in gray. It is yellowish red, strong brown, reddish yellow, yellowish brown, red, or brownish yellow mottled in light gray or light brownish gray. The lower part of the Bt horizon has a higher percentage of grays than the upper part. Reaction ranges from extremely acid to strongly acid.

Rosenwall Series

The Rosenwall series consists of moderately deep, loamy, moderately well drained soils (fig. 20). Permeability is very slow. This soil is mainly in the southern half of Angelina County. Slopes range from 1 to 15 percent.

Soils of the Rosenwall series are clayey, mixed, thermic Aquic Hapludults.

Typical pedon of Rosenwall fine sandy loam, 1 to 5 percent slopes; about 2 miles south on Farm Road 844 from intersection with Farm Road 1818, 1.8 miles west on a dirt road to corner of Temple Eastex and Champion tracts. This pedon is on map sheet 35.

A—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak granular structure; slightly hard, friable; many fine, medium, and coarse roots; common very fine pores; few siliceous pebbles 0.75 inch to 1.25 inches in diameter; strongly acid; clear smooth boundary.

E—4 to 7 inches; brown (10YR 5/3) fine sandy loam; structureless; slightly hard, friable; strongly acid; clear wavy boundary.

Bt1—7 to 15 inches; red (2.5YR 4/8) clay; moderate fine subangular blocky structure; hard, firm; many fine, medium, and coarse roots; few fine pores; thin patchy clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—15 to 23 inches; red (2.5YR 4/8) clay; common medium distinct light gray (10YR 6/1) mottles; medium fine subangular blocky structure; hard, firm; few fine pores; thin patchy clay films on faces of peds; few fragments of gray shale; strongly acid; clear smooth boundary.

BC—23 to 27 inches; mostly red (2.5YR 4/8), light gray (10YR 6/1), grayish brown (10YR 5/2), and yellowish brown (10YR 5/6) platy clay; some coarse blocky structure that has thick clay flows; hard, firm; strongly acid; abrupt smooth boundary.

Cr—27 to 60 inches; distinctly layered red, grayish brown, and yellowish brown sandstone and siltstone.

The thickness of the solum ranges from 20 to 40 inches. The soil is saturated in the lower part of the Bt horizon for a few weeks in the spring.

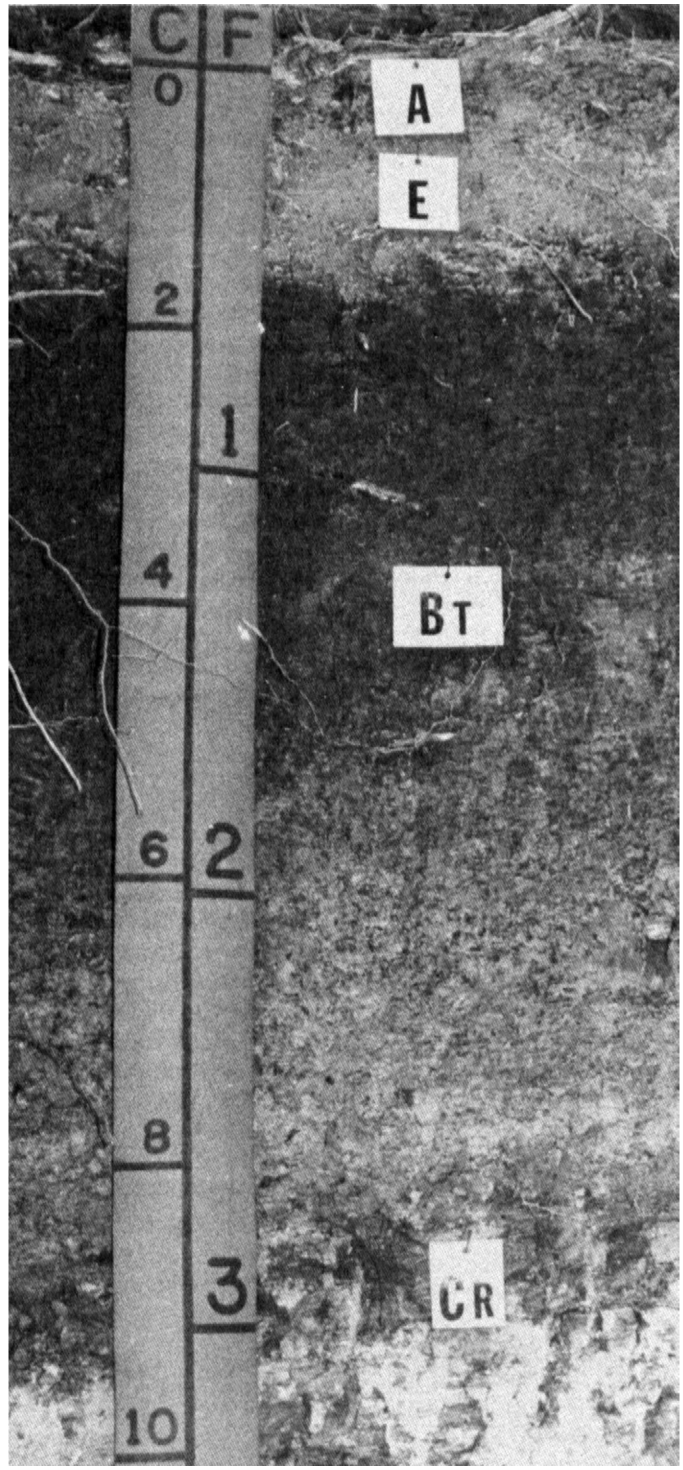


Figure 20.—Profile of Rosenwall fine sandy loam, 1 to 5 percent slopes. The soil developed from the stratified shale, siltstone, and sandstone that is at a depth of about 3 feet.

The combined thickness of the A and E horizons is 3 to 12 inches. The A horizon is very dark grayish brown, dark grayish brown, grayish brown, brown, or dark brown. Reaction ranges from slightly acid to very strongly acid. The E horizon is brown or pale brown. Some pedons do not have an E horizon.

The upper part of the Bt horizon is red, yellowish red, or reddish brown. Mottles range from none to common and are strong brown, light gray, or light brownish gray. The lower part has high chroma colors of red, yellowish red, or strong brown and low chroma colors of light gray or light brownish gray. The upper 20 inches of the Bt horizon has clay content of 60 to 70 percent. Reaction of the Bt horizon ranges from medium acid to very strongly acid.

The Cr layer is weakly cemented to strongly cemented sandstone or siltstone interbedded with shale, shaly clay, or loamy sediment.

Sacul Series

The Sacul series consists of deep, loamy, moderately well drained soils on uplands. Permeability is slow. These soils formed in clayey coastal plain sediment. Slopes range from 1 to 15 percent.

Soils of the Sacul series are clayey, mixed, thermic Aquic Hapludults.

Typical pedon of Sacul fine sandy loam, 1 to 5 percent slopes; 6.5 miles northwest of Lufkin on Texas Highway 103 from its intersection with Loop 287, at St. Regis Headquarters, 3.0 miles north on Newman Cemetery road. This pedon is on map sheet 5.

A—0 to 5 inches; dark brown (10YR 4/3) fine sandy loam; weak medium granular structure; soft, very friable; strongly acid; clear wavy boundary.

E—5 to 8 inches; brown (10YR 5/3) fine sandy loam; structureless; soft, very friable; very strongly acid; abrupt smooth boundary.

Bt1—8 to 16 inches; red (2.5YR 4/6) clay; moderate medium blocky structure; hard, firm; very strongly acid; gradual smooth boundary.

Bt2—16 to 27 inches; red (2.5YR 4/6) clay; common medium prominent light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; hard, firm; very strongly acid; gradual smooth boundary.

Bt3—27 to 35 inches; mottled red (2.5YR 4/6), light gray (10YR 6/1), and strong brown (7.5YR 5/6) clay; moderate medium subangular blocky structure; hard, firm; very strongly acid; gradual smooth boundary.

Bt4—35 to 47 inches; light gray (10YR 6/1) clay; many prominent red (2.5YR 4/6) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; hard, firm; very strongly acid; gradual smooth boundary.

BC—47 to 56 inches; light gray (10YR 6/1) clay loam; many prominent red (2.5YR 4/6) and strong brown (7.5YR 5/6) mottles; massive to weak platy; hard, firm; strongly acid; gradual smooth boundary.

C—56 to 65 inches; alternate layers of strong brown (7.5YR 5/6) and yellowish red (5YR 5/6) sandstone and light gray (10YR 6/1) shale; very strongly acid.

The thickness of the solum ranges from 40 to 65 inches.

The combined thickness of the A and E horizons is 5 to 14 inches. The A horizon is very dark grayish brown, dark brown, dark grayish brown, and brown. Reaction ranges from very strongly acid to medium acid. The E horizon is brown or pale brown.

Clay content of the upper 20 inches of the Bt horizon ranges from 45 to 55 percent. The upper part of the Bt horizon is red and dark red and has few to common mottles of strong brown and light brownish gray in some pedons. The middle part of the Bt horizon is red and dark red mottled with gray, light gray, light brownish gray, and strong brown. The lower part of the Bt horizon is mottled with these colors, and in some pedons the gray is dominant. Reaction of the Bt horizon is very strongly acid or strongly acid.

The underlying material is alternate layers of red to strong brown soft sandstone and gray shale and has mixed textures that are silty clay loam, clay loam, or silt loam.

Sawtown Series

The Sawtown series consists of deep, moderately well drained soils on mounds on terraces and low uplands. Permeability is moderately slow. These soils formed in material that was modified by the wind and deposited over more clayey sediment. Slopes are less than 2 percent.

Soils of the Sawtown series are fine-silty, siliceous, thermic Glossic Paleudalfs.

Typical pedon of Sawtown fine sandy loam in an area of Keithville-Sawton complex, gently undulating; in timber, about 11 miles north of Lufkin and 3 miles west of Pollok, 0.5 mile east on Texas Highway 7 from intersection with Farm Road 1819, about 150 feet south of highway. This pedon is on map sheet 4.

A—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak medium granular structure; soft, very friable, nonsticky and nonplastic; common roots of all sizes; slightly acid; clear smooth boundary.

E1—5 to 11 inches; brown (10YR 5/3) fine sandy loam; massive but porous; soft, friable, nonsticky and nonplastic; common fine and coarse roots; medium acid; gradual wavy boundary.

E2—11 to 17 inches; pale brown (10YR 6/3) fine sandy loam; massive but porous; soft, friable, nonsticky and nonplastic; common medium and fine roots; strongly acid; gradual wavy boundary.

Bt1—17 to 23 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; slightly hard, friable; slightly sticky and slightly plastic; common medium and fine roots; strongly acid; gradual wavy boundary.

Bt2—23 to 35 inches; yellowish brown (10YR 5/6) loam; few medium distinct pale brown (10YR 6/3) mottles and ped coatings; weak medium subangular blocky structure; slightly hard, firm, slightly sticky and plastic; few fine and medium roots; strongly acid; clear wavy boundary.

2Bt/E1—35 to 58 inches; distinctly mottled yellowish red (5YR 4/6), yellowish brown (10YR 5/6), and light gray (10YR 6/1) clay loam; about 15 to 20 percent, by volume, ped interiors that have ped coatings of light gray (10YR 6/1) loamy material; weak coarse prismatic structure parting to weak subangular blocky; hard, firm, sticky and plastic; few fine roots; strongly acid; gradual wavy boundary.

2Bt/E2—58 to 65 inches; light gray (10YR 7/2) clay loam; distinct strong brown (7.5YR 5/6) mottles; 10 percent stripped areas and ped coatings of light gray (10YR 6/1) loamy material; weak coarse prismatic structure parting to weak medium subangular blocky; hard, firm, sticky and plastic; strongly acid.

The thickness of the solum exceeds 60 inches. Base saturation at a depth of 50 inches below the top of the argillic horizon ranges from 45 to 80 percent.

The combined thickness of the A and E horizons ranges from 15 to 30 inches. Reaction ranges from slightly acid to strongly acid in the A and E horizons. The A horizon is dark grayish brown, dark brown, or brown. The E horizon is brown or pale brown.

The Bt horizon is silt loam, loam, or silty clay loam. The matrix is strong brown or yellowish brown. Mottles of red or yellowish red are in some pedons. Weighted average clay content of the upper 20 inches of the argillic horizon ranges from 18 to 30 percent, and the silt content is 30 to 50 percent.

The 2Bt/E horizon is typically mottled in red, yellowish red, or strong brown. Low chroma colors are pale brown, light gray, or light brownish gray. Interfingering and ped coats of very fine sand, silt loam, or loam make up 5 to 20 percent of the matrix. The ped interiors are clay loam, silty clay, silty clay loam, or clay. The clay content is 35 to 55 percent. Depth to the 2Bt/E horizon ranges from 30 to 50 inches. Reaction ranges from slightly acid to strongly acid.

Some pedons have a C horizon of shale is above 2 meters.

The Sawtown soils in this survey area are taxadjuncts to the Sawtown series because field data from two pedons indicate that the soils have 15 to 19 percent sand coarser than very fine sand in the control section. The use, management, and behavior are not affected by this difference.

Stringtown Series

The Stringtown series consists of deep, loamy, well drained soils on uplands. Permeability is moderate. These sloping to steep soils formed in weakly consolidated loamy sediment on the coastal plain. Slopes range from 5 to 35 percent.

Soils of the Stringtown series are fine-loamy, siliceous, thermic Typic Hapludults.

Typical pedon of Stringtown fine sandy loam, 5 to 15 percent slopes; in south part of Angelina County, from the intersection of Farm Road 844 and Farm Road 1818, about 4 miles south on Farm Road 844, on Wolf Hill. This pedon is on map sheet 42.

A—0 to 7 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; soft, very friable; many fine, medium, and coarse roots; few ironstone gravel up to 0.5 inch in diameter; strongly acid; clear smooth boundary.

E—7 to 12 inches; pale brown (10YR 6/3) fine sandy loam; weak fine granular structure; soft, very friable; few fine, medium, and coarse roots; about 10 percent, by volume, ironstone gravel up to 0.5 inch in diameter; strongly acid; clear smooth boundary.

Bt1—12 to 24 inches; strong brown (7.5YR 5/8) sandy clay loam; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few medium and coarse roots; about 10 percent, by volume, ironstone gravel; yellowish red clay films; very strongly acid; gradual wavy boundary.

Bt2—24 to 41 inches; strong brown (7.5YR 5/8) sandy clay loam; few red (2.5YR 4/6) mottles; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; very strongly acid; gradual wavy boundary.

BC—41 to 50 inches; mostly weathered layers of yellowish brown (10YR 5/8) and red (2.5YR 4/6) sandstone and light gray (10YR 6/1) shale; some soil similar to Bt2; platy structure; very strongly acid; gradual smooth boundary.

C—50 to 65 inches; thinly bedded light gray (10YR 6/1) shale and strong brown (7.5YR 5/8) and red (2.5YR 4/6) soft sandstone; strata of shale 0.25 inch to 2.0 inches thick; sandstone weakly cemented; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches. Base saturation ranges from 25 to 35 percent.

The combined thickness of the A and E horizons ranges from 6 to 12 inches. Reaction ranges from slightly acid to very strongly acid. The A horizon is dark grayish brown, dark brown, or brown. Ironstone pebbles

and angular fragments make up 1 to 20 percent, by volume, of the A horizon. A few ironstone cobbles up to 6 inches in diameter occur in some pedons. The E horizon is pale brown, brown, or light yellowish brown.

The Bt horizon is sandy clay loam or clay loam. Clay content of the upper 20 inches of the Bt ranges from 20 to 35 percent. The Bt horizon is strong brown or yellowish brown. Red and light gray mottles are in the lower part of the horizon. The gray is caused by shale fragments. The Bt horizon typically contains 1 to 15 percent, by volume, pebbles and flattened fragments of ironstone. Reaction is strongly acid or very strongly acid. Plinthite makes up 1 to 5 percent, by volume, of the lower Bt horizon.

The C horizon is stratified sandy clay loam, shale, and sandstone in shades of gray, red, and brown. The strata of sandstone can be cut with a spade. Reaction ranges from strongly acid to extremely acid.

Tehran Series

The Tehran series consists of deep, sandy, somewhat excessively drained soils on uplands. Permeability is moderately rapid. These strongly sloping soils formed in thick, sandy sediment of the coastal plains. Slopes range from 8 to 15 percent.

Soils of the Tehran series are loamy, siliceous, thermic Grossarenic Paleudults.

Typical pedon of Tehran loamy sand, 8 to 15 percent slopes; about 0.5 mile north of Jasper County line on Texas Highway 63, 450 feet east on a dirt road, and 125 feet north. This pedon is on map sheet 45.

A—0 to 4 inches; dark grayish brown (10YR 4/2) loamy sand; weak fine granular structure; loose, nonsticky and nonplastic; many fine and common medium and coarse roots; strongly acid; clear smooth boundary.

E1—4 to 9 inches; brown (10YR 5/3) loamy sand; few dark grayish brown (10YR 4/2) stains; single grained; loose, nonsticky and nonplastic; few medium and coarse roots; strongly acid; clear smooth boundary.

E2—9 to 53 inches; pale brown (10YR 6/3) loamy sand; single grained; loose, nonsticky and nonplastic; few coarse roots; strongly acid; clear smooth boundary.

Bt—53 to 80 inches; mottled strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) sandy clay loam; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; thin patchy clay films on faces of peds; strongly acid.

The thickness of the solum exceeds 80 inches. Reaction ranges from very strongly acid to medium acid throughout the soil. Clay content in the upper 20 inches of the argillic horizon ranges from 18 to 32 percent. Base saturation at 72 inches below the surface ranges from 15 to 30 percent. The sand fraction is 10 to 25 percent coarse or very coarse sand.

The combined thickness of the A and E horizons is 40 to 72 inches. The A horizon is dark grayish brown, dark brown, or brown. The E horizon is pale brown, brown, or light yellowish brown. Mottles are in shades of yellow and brown. Some pedons have 5 to 10 percent siliceous gravel.

The Bt horizon is yellowish red, strong brown, or yellowish brown. Mottles in shades of yellow, red, and brown are common. Mottles in chroma of 2 or less are 60 inches or more below the surface. The texture of the Bt horizon is sandy clay loam but ranges to sandy loam in some pedons. The Bt horizon of some pedons contains 5 to 10 percent siliceous gravel. Plinthite ranges from 0 to 5 percent, by volume.

Tenaha Series

The Tenaha series consists of deep, sandy, well drained soils on uplands. Permeability is moderate. These soils formed in acid, loamy and clayey sediment. Slopes are 5 to 15 percent.

Soils of the Tenaha series are loamy, siliceous, thermic Arenic Hapludults.

Typical pedon of Tenaha loamy fine sand, 5 to 15 percent slopes; in timber, 1.5 miles north of Zavalla on Farm Road 2109, 200 feet northwest of Moss Hill firetower. This pedon is on map sheet 31.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loamy fine sandy; weak medium granular structure; soft, loose; many fine roots; slightly acid; clear smooth boundary.

E—5 to 25 inches; pale brown (10YR 6/3) loamy fine sand; single grained; soft, loose; many roots; few hard iron-manganese concretions; slightly acid; gradual smooth boundary.

Bt1—25 to 38 inches; strong brown (7.5YR 5/6) sandy clay loam; common medium faint yellowish red (5YR 5/6) mottles; weak medium blocky structure; slightly hard, friable; continuous thick clay films; few pebbles; strongly acid; gradual smooth boundary.

Bt2—38 to 56 inches; strong brown (7.5YR 5/6) sandy clay loam; few medium distinct red (2.5YR 4/8) mottles; weak medium subangular blocky structure; hard, friable; patchy clay films on vertical faces of peds; strongly acid; gradual smooth boundary.

C—56 to 65 inches; yellowish red (5YR 5/8) and strong brown (7.5YR 5/6) soft sandstone; weakly consolidated; very strongly acid.

The thickness of the solum is 40 to 60 inches. A few gravels are in most pedons.

The combined thickness of the A and E horizons ranges from about 22 to 40 inches. Reaction ranges from strongly acid to slightly acid. The A horizon is very dark grayish brown, dark grayish brown, grayish brown,

dark brown, or brown. The E horizon is pale brown, brown, or light yellowish brown.

The Bt horizon is yellowish red and strong brown. Mottles are yellowish red, strong brown, and red. Average clay content of the Bt horizon is 22 to 35 percent in the upper 20 inches. Pockets of gray weathered shale are common in the lower part of the Bt horizon. Reaction is strongly acid or very strongly acid.

The C layer is soft sandstone that has thin layers of gray shale.

Woodtell Series

The Woodtell series consists of deep, loamy, moderately well drained soils on uplands. Permeability is very slow. These soils formed in clay and shale sediment of the coastal plain Cook Mountain Formation. Slopes range from 1 to 15 percent.

Soils of the Woodtell series are fine, montmorillonitic, thermic Vertic Hapludalfs.

Typical pedon of Woodtell very fine sandy loam, 1 to 5 percent slopes; in timber, 1.7 miles northeast on Texas Highway 7 from intersection with U.S. Highway 69, 600 feet northwest on pipeline, 20 feet north. This pedon is on map sheet 2.

A—0 to 2 inches; dark grayish brown (10YR 4/2) very fine sandy loam; moderate medium granular structure; friable, slightly hard; many medium and coarse tree roots; few siliceous pebbles; strongly acid; abrupt wavy boundary.

E—2 to 4 inches; pale brown (10YR 6/3) very fine sandy loam; massive; slightly hard, friable; many medium roots; few siliceous gravels; very strongly acid; clear wavy boundary.

Bt1—4 to 10 inches; red (2.5YR 4/8) clay; strong medium subangular blocky structure; very hard, very firm; few medium roots; very strongly acid; gradual wavy boundary.

Bt2—10 to 23 inches; yellowish red (5YR 5/8) clay; distinct light gray (10YR 6/1) mottles; moderate medium subangular blocky structure; very firm, very hard; few fine roots; very strongly acid; gradual wavy boundary.

Bt3—23 to 38 inches; mottled light gray (10YR 6/1) and yellowish red (5YR 5/8) clay; weak medium subangular blocky structure; extremely hard, extremely firm; few fine roots; few medium and large intersecting slickensides; very strongly acid; gradual smooth boundary.

BC—38 to 41 inches; mottled light gray (10YR 6/1) and yellowish red (5YR 5/8) platy clay; weak medium subangular blocky structure; extremely hard, extremely firm; few medium and large intersecting slickensides; common pieces of olive gray (5Y 5/2) shale; strongly acid; gradual smooth boundary.

Cy—41 to 60 inches; light gray (10YR 6/1) and olive yellow (2.5Y 6/6) shale; few gypsum crystals; slightly acid.

The thickness of the solum ranges from 40 to 60 inches.

The combined thickness of the A and E horizons ranges from 3 to 8 inches. Reaction ranges from medium acid to very strongly acid. The A horizon is very dark grayish brown, brown, dark grayish brown, or dark brown. The E horizon is brown, pale brown, or very pale brown.

The Bt horizon is typically red and has gray and light brownish gray mottles in the upper part. The gray increases as the depth increases. The lower part of the Bt horizon is light gray or gray mottled in shades of red, yellow, and olive. Texture of the Bt horizon ranges from 50 to 60 percent clay. Reaction ranges from extremely acid in the upper part to medium acid in the lower part.

The Cy horizon is gray to olive shale. Reaction ranges from very strongly acid to neutral. A few gypsum crystals are in most pedons.

Formation of the Soils

In this section the factors of soil formation are described as they relate to the soils in the survey area. The processes of soil formation are described.

Factors of Soil Formation

The characteristics of a soil at any given point are determined by the physical and mineral composition of the parent material; the climate under which the parent material accumulated and has existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time the forces of soil formation have acted on the soil material. All of these factors have influenced the present characteristics of every soil in Angelina County, but the significance of each factor varies from one place to another.

The interrelationship among these five factors is complex, and the effects of any one factor cannot be isolated and completely evaluated. However, each factor and its probable effects are discussed separately.

Parent Material

Parent meterial is the unconsolidated mass from which soil is formed. It determines the textural, chemical, and mineral composition of the soil. The soils of Angelina County formed in unconsolidated sediment of the Eocene, Oligocene, Pleistocene, and Holocene geologic ages of the Tertiary and Quarternary Systems.

Deposits of Eocene age (about 40 to 45 million years) are the Sparta, Cook Mountain, and Yegua Formations of the Claiborne Group and the Caddell, Wellborn, and Manning Formations of the Jackson Group. The volcanic deposits of the Whitsett and Catahoula Formations are of early and late Oligocene age. The fluviatile terraces in Angelina County are probably of Pleistocene age. Holocene age sediment is alluvial deposits of the Angelina and Neches Rivers and many smaller streams.

In the extreme northern tip of the county, the Sparta Formation is probably represented by moderately steep to steep slopes of Cuthbert soils. In this area, deposits are interbedded layers of soft sandstone and shale.

The Cook Mountain Formation is also in the northern part of the county, generally from Pollok to Central and on to Redland. It is characterized by clayey and shaly deposits that are generally gypsiferous and sometimes calcareous. Woodtell and Lacerda soils have developed from these plastic clays that contain gypsum in the lower part of the profile. The Naclina and Etoile soils formed in the calcareous areas of the Cook Mountain Formation.

The Yegua Formation is in the middle of the county. This belt includes the area north of Diboll, Lufkin, and Huntington. At its confluence with the Cook Mountain Formation are a few sand hills on which Lilbert, Darco, Tenaha, and Rentzel soils have formed. However, these areas are minor, and most of the area consists of loamy sediment underlain by weakly cemented sandstone or loamy windblown sediment underlain by cemented siltstones. Keltys and Kurth soils formed in the loamy and sandstone sediment, and Fuller soils formed in the windblown and siltstone sediment.

Moswell, Diboll, Rosenwall, Herty, and Raylake soils formed in the Jackson Group (the Caddell, Wellborn, and Manning Formations).

Corrigan, Browndell, Stringtown, Letney, Tehran, Rayburn, and Kisatchie soils are in the extreme southern part of the county in the Whitsett and Catahoula Formations and in remnants of the Willis Formation.

At least four different levels or elevations of wind-modified terraces are deposited in Angelina County. The Bernaldo, Keithville, and Sawtown soils are on the highest terraces in the area near Pollok. Another level of wind-modified terraces includes the Moten and Multey soils. The large area of Alazan-Besner soils near Lake Kurth is another level of terrace material. Mollville, Besner, and Bienville soils are on the lowest terraces that are immediately above the present stream flood plains. Most of these terraces are probably of Pleistocene age.

The youngest deposits are the present stream bottom lands. These deposits are of Holocene age.

Climate

The climate of Angelina County is subtropical and humid. The moderate to large amount of rainfall has promoted moderately rapid formation of soils throughout the county. Rainfall is uniform over the entire county; its effect, however, is modified locally by runoff caused by steepness of slope. Because of this uniformity of climate, the differences among the soils in Angelina County are not attributed to climate differences.

Plant and Animal Life

In Angelina County, plants, insects, micro-organisms, crayfish, earthworms, and other forms of living organisms have contributed to the development of the soils. Increased organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in structure and porosity are caused by plant and animal life.

Vegetation, dominantly trees, has had great effect on soil formation in the county. The soils that formed under trees are generally low in content of organic matter and light in color. Grasses have had little affect on the formation of soils in the county.

Relief

Relief or topography influences soil development through its effect on drainage, runoff, and depth of penetration by soil moisture. The topography of Angelina County ranges from nearly level to steep. The nearly level areas consist of bottom lands and terraces. Most of the broad interstream divides are gently sloping to sloping. Side slopes above drainageways are generally strongly sloping to moderately steep. A few hills are steep.

If other factors are equal, the degree of soil profile development depends on the amount and depth of penetration by soil moisture. The more times a soil passes through a wetting and drying cycle, the greater and the more distinct will be the soil development.

Soils on a nearly level landscape tend to have marked differences in development depending on their natural drainage. Many nearly level soils are poorly drained and remain saturated with water much of the time. These soils do not have pronounced soil horizonation. They are gleyed and generally are not developed below a depth of 60 inches. However, well drained soils that are nearly level can be distinctly developed to a depth of more than 80 inches.

Most of the gently sloping to sloping soils are developed to a depth of more than 60 inches.

As the slope gradient in Angelina County increases, especially to more than 8 percent, the depth of water penetration distinctly decreases. Because much of the water is removed by runoff, soil development is less. The strongly sloping to steep Cuthbert soils, which are on rounded knobs or side slopes of hills and ridges, have moderately deep soil development.

Time

A great length of time is required for the formation of soils with distinct horizons. The differences in the length of time that the parent material has been in place are commonly reflected in the degree of development of soil horizons. Young soils have very little horizon development; old soils have well-expressed horizons.

The Mantachie and Marietta soils are young soils. They formed in sediment recently deposited on bottom lands by soil-laden flood waters. These soils have little horizon development.

The Bienville and Mollville soils are soils of intermediate development. Because they are on fluviatile terraces that have not been in place as long as most formations in the county, these soils have not had time for maximum development. Unlike many other soils on uplands, neither of these soils has been leached of bases.

Advanced development is evident in the Lilbert soils. These soils have distinct horizonation, have been leached of most bases, and have accumulations of iron-enriched nodules (plinthite).

Interaction of Factors

The interaction of the five major factors of soil formation has caused some very pronounced differences among the soils in Angelina County. Although no one of the five factors can be separated from the other four, some factors have a more pronounced effect on soil formation under certain conditions.

The Etoile and Naclina soils have one major difference from all other soils in the county; they are calcareous. Two likely reasons why calcium still remains in these soils when other soils have been leached of most bases are that the parent material probably had a higher content of calcium carbonate and it is a very plastic, clayey shale that allows little leaching.

Because of wetness, Mollville, Fuller, and Diboll soils have more crayfish activity than other soils in the county. Crayfish burrow into the soil and bring clay from the subsoil to the surface. As water penetrates downward, this clay is transported back into the subsoil.

Surface Geology

Saul Aronow, Department of Geology, Lamar University, Beaumont, Texas, prepared this section.

Angelina County is in the West Gulf Coast subdivision of the Atlantic and Gulf Plains geomorphic unit *(11)*. Most of the surface rocks, the parent material of the soils, are Eocene to Pliocene-Pleistocene age. They crop out in east-west bands and dip gently Gulfward at less than 2 degrees or about 185 feet per mile. The oldest surface rocks are in the northwest part of the county, the youngest in the southeast. Stream sediment, some now in terrace positions, and eolian and colluvial sediment range from early Pleistocene to Holocene age.

The county lies between the Neches River on the west and the now partly inundated Angelina River on the east. U.S. Highway 69 and Texas State Highway 63 are located approximately on the drainage divide between the two rivers.

The Neches River northwest of Diboll flows perpendicular to the strikes of the rocks. To the southwest it is deflected eastward by resistant outcrops

or cuestas of the younger formations of the Jackson Group and of the Catahoula Formation. These formations comprise a regionally extensive ridge system, the Kisatchie Wold or Cuesta.

The Angelina River as it flows past the northwestern part of the county parallels the eastward-striking Sparta and Cook Mountain Formations before it cuts directly across the Yegua Formation and the younger formations.

The geology of the county has been detailed on two recent maps: the Palestine Sheet of the Geologic Atlas of Texas *(24)* and Sheets 4 and 5 of the Environmental Geology of the Yegua-Jackson Lignite Belt, Southeast Texas *(13)*.

Claiborne Group

The oldest formations in the county, the Sparta Sand and the Cook Mountain and Yegua Formation, make up the upper part of the Claiborne Group of Middle Eocene age *(5)*.

The Sparta Sand is the oldest unit in this group. As shown on the Palestine Sheet, it crops out in the extreme northern part of the county on uplands sloping toward the Angelina River, just southwest of the flood plain. A smaller scale map shows no Sparta sand outcrop in the county *(15)*. The Sparta Sand in Angelina County is considered to be a deltaic deposition. The Sacul-Cuthbert-Kirvin, Woodtell, and Bernaldo-Kiethville-Sawtown general soil map units (map units 5, 6, and 13) are in the area assumed to be outcrop of Sparta sand. The sandy C horizon of the Sacul, Cuthbert, and Kirvin soils may be Sparta age distributary deposits (sandstones). The Woodtell soils and other soils that have a clayey subsoil and underlying material are finer-grained interdistributary deposits (mudstones, shales, or clays) and are considered by some to be outliers of the Cook Mountain Formation. The Sparta sand is discontinuously exposed in patches where the overlying Cook Mountain Formation has been eroded away. The soils of the Sparta Sand Formation are generally distinctive from the younger soils of the Cook Mountain and Yegua Formations.

The Cook Mountain Formation is mostly gypsiferous clay and marl that contains marine macro-fossils in many places. Locally, this formation is grayish-green because of the presence of glauconite. This formation is a shallow-shelf marine deposit that came after the deposition of the deltaic Sparta Sand. Because of the gypsiferous clayey subsoil and underlying material, the soils of the Woodtell general soil map unit are most representative of the Cook Mountain Formation. If soils that have a clay or shale subsoil and underlying material are not inliers of the Sparta Sand, they may be part of the Spillar Sand Member of the Cook Mountain Formation *(13, 19)*. The soils of the Keltys-Kurth general soil map unit are generally on younger formations, so an error in the geologic mapping may have occurred.

The Yegua Formation is the youngest formation in the Claiborne Group. It is of fluvial-deltaic origin *(6, 13)* and is the product of a marine regression (or shoreline progradation) over the previously deposited Cook Mountain Formation. The northern part of the Yegua Formation is sandier than the more clayey southern part. The coarser-grained soils of the Keltys-Kurth map unit to some extent, confirm this. The Yegua Formation is the most extensively exposed formation in the county.

The area underlain by the Yegua Formation includes the Fuller-Keltys, Keltys-Kurth, Rosenwall and Sacul-Cuthbert-Kirvin general soil map units (map units 1, 2, 4, and 5). Of these, the Fuller-Keltys and Keltys-Kurth map units are essentially confined to this formation, though several of the soils in these map units are in younger formations.

Parent material of soils in the Yegua Formation reflect the fluvial and deltaic origins. The parent material includes sandstones and some siltstones as channel, point bar, and distributary deposits; siltstones and laminated siltstones and shales as levee and crevasse splay deposits; and clays, shales, and mudstones as flood basin or interdistributary deposits.

The major soils on the Yegua Formation are the Fuller, Keltys, and Kurth soils. These soils have lithologic discontinuities in their profiles.

Jackson Group

The Caddell, Wellborn, Manning, and Whitsett Formations make up the upper Eocene age Jackson Group. These formations are thought to be part of a sequence of deposits as the shoreline prograded into the Gulf of Mexico *(6)*.

The Caddell Formation is the oldest unit in this group *(6, 13, 24)*. It is principally a clay that has some locally glauconitic, very fine sand of prodelta origin. Soils on this formation are in the Diboll-Keltys, Alazan-Moswell, and Moswell-Bernaldo general map units (map units 3, 10, and 11). The parent material of the major soils in these map units are fine-grained mudstones, shales, and clays.

The Wellborn and Manning Formations are the next youngest formations in this group. The soils of the Diboll-Keltys, the Rosenwall, and the Alazan-Moswell general soil map units (map units 3, 4, and 10) are on these formations.

The Wellborn Formation is very fine to medium, slightly glauconitic sand interbedded with clays *(6, 13, 24)*. The sands are channel-mouth bars of a delta front environment, and the clays are deposits in the interbar areas. The Wellborn Formation outcrops just east of Zavalla and towards the Sam Rayburn Reservoir.

The Manning Formation rests directly on the Caddell Formation. It is lithologically similar to the Wellborn Formation except that glauconite is absent and the clays are sandier. The Manning Formation is a delta plain deposit.

The parent material of soils on the Wellborn and Manning Formations are sandy and silty for the Keltys, Diboll, and Alazan soils and are clays, mudstones, and shales for the Rosenwall, Moswell, Herty, and Raylake soils.

The Witsett Formation is the youngest unit of the Jackson Group. It is the product of the fluvial and final stage of the marine regression of the group. The Witsett Formation is a fine to medium grained, tuffaceous and clayey sandstone interbedded with clay including some sandy and silty clays. Some of the sands are locally cemented with a siliceous or opaline material and resemble quartzite.

Most of the outcrop area of the Whitsett Formation is overlain by the Rayburn-Corrigan-Stringtown general soil map unit (map unit 15). Some small areas are covered by the southernmost extensions of the Diboll-Keltys and Alazan-Moswell map units (map units 3 and 10). The tuffaceous Rayburn, Corrigan, Browndell, and Kisatchie soils developed on the Whitsett Formation. The parent material of Rayburn soils are channel and point bar deposits. The Corrigan soils are levee deposits, and the Brondell and Kisatchie soils are flood basin deposits.

Catahoula Formation

In the southeastern part of the county, the Whitsett Formation and the overlying Catahoula Formation of late Oligocene to early Miocene age have the same boundaries. The Catahoula Formation within the Rayburn-Corrigan-Stringtown general soil map unit (map unit 15) is essentially dissected and occurs as outliers (separated from the main formation by erosion) or discontinuous patches. It is similar in its fluvial origin to the Whitsett Formation and virtually the same tuffaceous soil series are developed on it *(9)*. The Catahoula Formation is also locally cemented with a siliceous material, and some rocks and layers resemble quartzite.

In the Rayburn-Corrigan-Stringtown general soil map unit (map unit 15), the Stringtown soils are on outliers of the Willis Formation which lies on both the Whitsett and Catahoula Formations. In the Letney-Stringtown-Tehran general soil map unit (map unit 16), the Catahoula Formation is largely continuous and undissected, but is mostly overlain by the Willis Formation. Within this area, the Rayburn soils surface the Catahoula Formation.

Most of the volcanic ash in the Whitsett and Catahoula Formations have been weathered to bentonitic clays and reworked by streams and mass-wasting processes. The weathering probably preceded and followed the transportation of the volcanic ash from its places of deposition *(7)*. Undisturbed volcanic ash and bentonite is in some lacustrine sites in a paleo-flood basin environment. The rain of volcanic ash started in middle Eocene time and continued through early Miocene time. The ash was blown in from northwestern Mexico, New Mexico, and Trans-Pecos Texas.

Willis Formation

The Willis Formation is the youngest unit in the county. It is generally exposed in the southeastern part of the county. This formation does not contain fossils that would indicate its age nor any volcanic ash deposits on which to base radiometric dates. It is probably correlative with the Citronelle Formation of Louisiana, Mississippi, Alabama, and western Florida. Based on interfingering marine beds that have fossils, it would probably best be considered of Plio-Pleistocene age (about 2.5 to 3 million years old) *(3, 12, 14, 16)*. South of the county, the deposition of the Lissie and Beaumont Formations, which are younger than the Willis Formation, have been related to glacially-generated eustatic sea level changes of the Pleistocene age. The Willis Formation, if ranging upward into the Pleistocene age, would probably be pre-glacial.

The Willis Formation is fluvial and has a very high component of sand and gravel and a low content of clays that has small mixtures of silt and sand. The classic high-bedload streams develop braided patterns *(7)*. While the depositional patterns of Willis sediment have not been studied in Texas, studies in areas of the correlative Citronelle Formation suggest probable braided patterns *(16, 18)*. The Willis sediment may be contrasted with the mixed load, meandering depositional patterns of the older fluvial Yegua, Whitsett, and Catahoula Formations with their extensive clayey and silty overbank sediment.

Where the Willis Formation is deeply exposed in some road cuts and pits, it is often weathered to a depth of more than 12 feet, especially in the form of ironstone concretions, plinthite, and iron-oxide staining and cementation. This deep weathering may represent an ancient or relict lateritic or oxisolic weathering regime.

The Willis Formation was deposited unconformably on the eroded surfaces of the Catahoula, Whitsett, and older formations. The topographically lower positions of the Willis Formation among higher outcrops of older units may be because of faulting, but these reversals of topographic positions are more likely the result of deep Willis-age channeling into the older units and the subsequent removal of overlying Willis deposits *(10)*.

Willis outcrops are scattered throughout the county. The largest and least dissected tract of Willis outcrop is in the Letney-Stringtown-Tehran general soil map unit (map unit 16). The major soils of this map unit and the Melhomes soils developed on the Willis Formation. In the Rayburn-Corrigan-Stringtown general soil map unit (map unit 15), the Stringtown soils and the included Letney soils are on this formation. The Darco, Tenaha, and Lilbert soils in the Alazan-Moswell general soil map unit (map unit 10) just east of Zavalla along State Highway 147 and the Lilbert, Rentzel, Stringtown, and Tenaha soils in the Rosenwall general soil map unit (map unit 4) south of Manning and between Shawnee

and Buck Creeks also formed on the Willis Formation. In the northern part of the county, north and northwest of Lufkin, the Lilbert, Darco, and Tenaha soils in the Sacul-Cuthbert-Kirvin general soil map unit (map unit 5) are also underlain by the Willis Formation.

The small, unmappable areas of siliceous, cherty gravels on the surface and in the sola of the Rosenwall, Fuller, Keltys, Kurth, and Kirvin soils suggest a former widespread, almost blanketing occurrence of the Willis Formation.

The several Willis outcrops areas and the soils that developed on this formation principally fall within the Dissected Sand and Mud, Sand Hills, Low Rolling Hills, and Fine Sand geological units. These units include several other formations and many other soil series in the county.

Post-Willis Pleistocene Stream Terraces and Eolian Deposits

The several terrace levels and their related eolian deposits are represented by the soils of the Besner-Mollville-Bienville, Bernaldo-Keithville-Sawtown, and Moten-Multey general soil map units (map units 12, 13, and 14). Different terrace levels may occur within one general soil area, or the same or similar level may occur in two or more areas.

These general soil areas contain mounded soils. The mounds are known as "pimple mounds," and range in the Gulf coast region from the vicinity of Corpus Christi into east Texas. These mounds are as far north as Minnesota, east into Louisiana, and west in Colorado, California, Washington, and Oregon. For the most part, they seem to be Pleistocene to early Holocene age, regardless of the geologic substrate underlying the mounds. The mounds are 20 to 50 feet in diameter and rarely more than 5 feet in height. They are generally underlain by sandy or loamy soils *(4)*.

The Bernaldo-Keithville-Sawtown general soil map unit (map unit 13) is the highest and most topographically varied of the three map units on this formation. It lies mainly over the Cook Mountain Formation and the northern, or stratigraphically lower, part of the Yegua Formation. Elevations range from about 200 to 400 feet. In some places, the lower elevations seem to merge into the upper elevations of some of the lower terrace levels. Some flat terrace-like remnants can be discerned along the east-west undesignated county road north of the east-west segment of FM 843 and in some areas northwest of Central along U.S. Highway 69. These surfaces may be structural in origin, that is, preserved temporarily by slightly more resistant bedding surfaces during the erosional lowering of the region. They might also be straths or stream terrace surfaces cut into the Cook Mountain or Yegua Formations.

The profile descriptions of the Keithville and Sawtown series show geologic discontinuities at the base of the last silt loam or loam horizon. The material above the discontinuity in these series may be wind-transported sediment from sub-adjacent paleo-flood plains deposited on structurally controlled surfaces. They also might be wind-reworked, thin, fluvial sediment on strath surfaces. In either case, the pimple mounds of the Sawtown series are products of this eolian activity.

Sparse siliceous pebbles are along the surface of the discontinuity of the Keithville and Sawtown soils. The pebbles may be recycled, residual Willis gravel or fluvial gravel left during the cutting of the possible strath surfaces. These pebbles are not recorded in the series descriptions.

The nominal and principal soils of the Moten-Multey general soil map unit (map unit 14) are located on dissected and fragmented terraces along the Neches River near Diboll and along Shawnee Creek. The flatter areas of Moten and Multey soils are from about 35 to 65 feet above the flood plain of the river. They are also less than 10 to more than 50 feet above stream level along the upper reaches of Shawnee Creek and are less than 30 feet above the creek level and the flood plain of the Neches River near the confluence of the creek and the river.

Like the possible terraces of the Bernaldo-Keithville-Sawtown general soil map unit (map unit 13), these surfaces are devoid of any relict fluvial geomorphic features, such as point bar ridge-and-swale topography or isolated meander loops. This indicates a rather complete reworking of the surface by eolian and mass-wasting processes.

The solum and parent material of the Moten and Multey soils are probably formed in fluvial terrace material. In places, these soils are co-planar and continuous with Tertiary soils, such as the Diboll, Fuller, Kurth, Keltys, and Rosenwall soils. This suggests that local straths were cut into their parent material. These soils are also found in some places downslope from the Moten and Multey soils where erosion and mass-wasting have exposed the underlying Tertiary deposits.

These fluvial terraces are less dissected, have a more systematic relationship to adjacent streams, and are probably younger than the possible fluvial terraces of the Bernaldo-Keithville-Sawtown general soil map unit.

Along the Neches River, the soils of the Besner-Mollville-Bienville general soil map unit (map unit 12) for the most part are located on the lowest terrace level above the occasionally flooded soils. These terraces range in elevation from about 5 to 20 feet above the bottom lands. In a few places, they are nearly level with or co-planar with soils on bottom lands. Because of this, in some places soils on terraces have been segmented and separated from soils on uplands by soils on bottom lands. A small area of Bernaldo soils between Rowan and Buncombe Creeks and due east of Pine Island are the highest occurrence of soils in this general soil map unit. The terraces here are at 60 to 70 feet above the bottom land and comparable to elevation of terraces in

the Moten-Multey general soil map unit with which they may be correlated.

Most of the soils in the Besner-Mollville-Bienville general soil map unit developed in fluvial terrace material or surface eolian material derived from adjacent fluvial material. Many meander scars scalloping the edge of the upland and many of the point bar ridge-and-swale complexes and relict meander fragments associated with the terraces have very large radii of curvature that are much greater than those of the present-day Neches River. These geomorphic features characterize the Deweyville Terrace deposits that are downstream on the Neches River where it debouches into Sabine Lake and on the adjacent Sabine and Trinity Rivers. Since there is a rough correlation between meander size and stream discharge, the deposits underlying these terraces were laid down during a period of higher rainfall. These high-rainfall, high-discharge episodes are part of the Pleistocene glacial advance-and-retreat cycle. The age of the Deweyville Terrace, based on radiocarbon dates on wood samples from outside the county, has been estimated between about 13,000 to about 25,000 years before the present. These dates bracket the last great sea level drop and rise before the Holocene age. Sea level fell because of the depleting of the oceans to form the continental glaciers. To the south of Angelina County, these soils are found on both the Deweyville Terrace and on older Pleistocene terraces. This may tell us more about the time of the wind's last reworking of the surface rather than the age of the terraces.

The terraces along the Angelina River, on which the soils of the Besner-Mollville-Bienville general soil map unit are located, are considerably higher than those along the Neches River. They are 30 to 70 feet above the Angelina River flood plain (now partly covered by the Sam Rayburn Reservoir). They are lower than the surface of the terraces in the Bernaldo-Keithville-Sawtown map unit and are less dissected and better preserved. The sola and parent material of the soils are in wind-worked fluvial material.

The terrace surface and the terrace material, as defined by the soils of Besner-Mollvile-Bienville map unit, terminate against scarps cut into the adjacent Tertiary uplands, unlike the partly strath terraces of the Moten-Multey map unit. But like the terrace surfaced with the soils of the Moten-Multey map unit along the Neches River, fluvial geomorphic features are absent. This and the similar elevation above the flood plain suggest a possible age correlation of the Moten-Multey terraces with that of the Besner-Mollville-Bienville terraces along the Angelina River.

The walls of the Angelina River flood plain display several large-radii, Deweyville-like meander scars, among them the site of Kurth Lake. Any Deweyville Terrace sediment would seem to be buried beneath subsequent Holocene Alluvium.

Holocene Alluvial Fills

The soils of the Ozias-Pophers, Koury, and Mantachie-Marietta general soil map units (map units 7, 8, and 9) developed on the Holocene alluvial fills of the Neches and Angelina Rivers and their tributaries. The alluvial surfaces are continuous with and graded to alluvial surfaces downstream on the Neches River to where it empties into Sabine Lake through a delta many miles to the south. The delta surface and the surfaces upstream are graded to modern sea level. About 18,000 years ago, sea level was about 260 to 400 feet below its present level and rose intermittantly to its present level 2,500 to 3,500 years ago. These last dates provide the lower limit for the age of the parent material of these soils on flood plains.

Along the Angelina River, the sandy and loamy Marietta soils are located along the southern margin of the flood plain, adjacent to the upland. They are about 5 feet higher than the adjacent clayey Mantachie soils through which the river flows.

The Ozias-Pophers map unit of the Neches River flood plain is slightly finer textured than the Mantachie and Marietta soils on the Angelina River flood plain. This suggests that the Angelina River is carrying a coarser load than the Neches River. Both streams are transporting and depositing mainly a suspended load of clay and silt. The coarser sand fraction is not a major component. The coarser Koury soils on the Neches River flood plain are associated, in terms of elevation and depositional patterns, with the lower parts of the Deweyville Terrace of the Besner-Mollville-Bienville map unit. The sandy Koury soils may be a relict from the waning stages of the high discharges that prevailed during the deposition of the Deweyville Terrace. The differences in mechanical composition of the Koury soils, as was suggested for the Marietta soils along the Angelina River, may be because of changes in stream regiment rather than processes now operating on the flood plain.

The Koury soils, as they appear in the alluvium of tributary streams, are in the outcrop area of the Yegua Formation, most of which drains into the Neches River. The sandy character of the Koury soils may reflect both the widespread sandstone and siltstone parent material of the soils on the Yegua Formation and the surficial sandy and loamy sola affected by eolian reworking and by recycled colluvial Willis-derived material. Downstream, the overbank, suspended load of the Neches River may dilute the Koury parent material and thus terminate the material before it reaches the flood plain of the river.

Summary

Very few of the soils in Angelina County are uniquely sited on a given geologic formation. The few that are include the Lacerda and Woodtell soils on the Cook Mountain Formation; the Fuller soils on the Yegua

Formation; the Browndell, Corrigan, Kisatchie, and Rayburn soils on the tuffaceous and, in places, Willis-influenced Whitsett and Catahoula Formation; and the Darco, Letney, Lilbert, Melhomes, Rentzel, Stringtown, Tehran, and Tenaha soils on the Willis Formation.

By contrast, some soils have considerable versatility. For example, the Moswell, Rosenwall, and Raylake soils are on formations from the Yegua to the Whitsett; the Etoile and Naclina soils are on the Cook Mountain and Caddell Formations; and the Keltys soils are on the Yegua, Caddell, Manning, and Whitsett Formations. The parent material of these soils ranges from a marginal marine prodelta to a delta front, a delta plain, or a fluvial deposit environment.

The similarities in parent material are also evident on the environmental study map *(13)* of the county, which covers the area roughly south of State Highway 103, most of the outcrop of the Yegua Formation, and all of the younger formations. Excluding the areas of soils on flood plains, most of the county is mapped as low relief sand and mud; interbedded sand, mud, and sandy mud; or fine sandy loam and loamy fine sand soils. Placing formation boundaries within the Tertiary in the face of these lithologic similarities is difficult *(9)*. Detailed mapping for much of this part of Texas, as seen for example in Stenzel's study of Leon County *(19)*, remains to be done. Despite the problems in geologic mapping and the lack of geologic specificity of many major soils, the general pattern of the general soil map and the most recent geologic map *(24)* is similar. The pattern is broad east-west trending bands of soil associations and formations, respectively.

Another aspect of the problems of similar soils on different geologic units and the lack of good lithologic distinctions among the geologic formations pertains to the lithologic discontinuities in some soils and, in more general terms, the genesis of the soils in relation to the presumed underlying parent material.

At least about 32 percent of the surface of Angelina County appears to have been covered by material of varying thicknesses not genetically related to the bedrock.

The lower part of the solum and the parent material of the Diboll, Fuller, Keltys, and Kurth soils formed in different material than the upper part of the solum. The upper part of the sola in many areas contain siliceous and cherty pebbles not found in the underlying C horizon. In some soils, the pebbles occur on the discontinuity surface, the classic stone line residuum *(8, 17)* of an eroded surface layer. The major soils involved make up about 25 percent of the county.

The Alazan-Besner, Bernaldo-Besner, Mollville-Besner, Moten-Multey, and Keithville-Sawtown complexes are mounded soils that make up about 7 percent of the county. On the assumption that mounds are formed by eolian activity producing lateral movement of surface material, these soils may be unrelated to and dissimilar to their underlying bedrock.

Lack of good exposures for geologic mapping in East Texas and the troublesome concealing cover sands that hid the formations can thus be put in perspective. Detailed work on other major soils not now considered to have lithologic discontinuities may in the future disclose lithologic breaks and even stone lines in their profiles. These soils include the Etoile, Cuthbert, Herty, Kirwin, Moswell, Rosenwall, Sacul, and Woodtell soils. Siliceous pebbles have been found occasionally in the sola of all of these. Future work may be able to document lithologic breaks in their profiles. These soils make up about 29 percent of the county. If added to the soils that recognized discontinuities and the mounded complexes, this yields a potential of about 61 percent of the soils in the county that have wind-modified sola and sola with lithologic discontinuities.

As may be surmised from the discussion of several general soil map units, the origins of material above the discontinuities are complex. Some of the covers are obviously modified by wind. In some cases, the wind-modified material is resting on a rather widely spaced stone line, which may be the last remnant of a Willis cover or even older gravelly units reprocessed by mass-wasting and slope erosion *(19)*. When the overlying material is sandy and contains scattered siliceous pebbles, reprocessed Willis cover is likely with little if any eolian imputs. The widespread, and in many cases, unmappable pockets of siliceous and cherty gravels on the surface testify to the once great extent of the Willis Formation. In some places, these gravels are essentially erosional remnants with little reprocessing. In others, they are the lag concentrate of a surface winnowed by overland flow erosion, by wind erosion, or both.

The lack of specific geologic make up of some soils, the lithologic discontinuities in some soils, and the difficulty of geologic mapping in Angelina County are the result of deposition, similar parent material, and the extent of the Willis Formation or other late Tertiary gravelly cover.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but that have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Cement rock. Shaly limestone used in the manufacture of cement.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in

diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). The volume of soft soil decreases excessively under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazingland for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly

drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, such as fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay are in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess salts (in tables). Excess water-soluble salts in the soil restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The movement of water into the soil is rapid.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fomes annosus. Laminated root rot that effects the entire root system.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant that is not a grass or a sedge.

Fragile (in tables). The soil is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green-manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is, in part, a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as accumulation of clay, sesquioxides, humus, or a combination of these; prismatic or blocky structure; redder or browner colors than those in the A horizon; or a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.

R layer.—Consolidated rock (unweathered bedrock) beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the plants that are the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material. This contrasts with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments that are 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Subsurface tunnels or pipelike cavities are formed by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated

wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). In these areas, surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of the acidity or alkalinity of a soil expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Rippable bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). There is a shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). The soil mass is susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, thickness of the line can be one fragment or more. It generally overlies material that weathered in place, and it is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in organic matter content than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils

are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed on the contour or at a slight angle to the contour across sloping soils. The terrace intercepts surface runoff, so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). An excessive amount of toxic substances in the soil, such as sodium or sulfur, severely hinders the establishment of vegetation or severely restricts plant growth.

Trace elements. Chemical elements, such as zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Unstable fill (in tables). There is a risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited in stream valleys by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors that are assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced by atmospheric agents in rocks or other deposits at or near the earth's surface. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of course grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. This contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data recorded in the period 1951-80 at Lufkin, Texas]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	59.0	37.5	48.3	80	14	129	3.55	1.50	5.29	7	.5
February---	63.4	39.9	51.7	83	19	145	3.05	1.75	4.20	6	.2
March------	70.8	46.9	58.9	87	24	303	3.38	1.42	5.03	6	.0
April------	78.5	55.8	67.2	90	34	516	4.27	1.83	6.34	5	.0
May--------	84.9	63.1	74.0	94	45	744	4.31	1.98	6.30	6	.0
June-------	90.7	69.4	80.1	98	57	903	3.39	1.40	5.06	5	.0
July-------	93.9	72.2	83.1	102	64	1,026	2.81	1.21	4.15	5	.0
August-----	93.9	71.2	82.6	103	60	1,011	2.46	.84	3.79	5	.0
September--	88.8	66.4	77.6	99	49	828	3.72	1.25	5.74	5	.0
October----	81.0	54.3	67.7	93	34	549	2.98	.80	4.73	4	.0
November---	69.2	44.7	57.0	87	23	242	3.59	1.70	5.21	6	.0
December---	62.2	39.0	50.6	82	17	114	3.97	2.05	5.65	6	.0
Yearly:											
Average--	78.0	55.0	66.6	---	---	---	---	---	---	---	---
Extreme--	---	---	---	104	13	---	---	---	---	---	---
Total----	---	---	---	---	---	6,510	41.48	32.50	49.92	66	.7

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 °F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data recorded in the period 1951-80
at Lufkin, Texas]

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 8	March 24	April 1
2 years in 10 later than--	February 26	March 16	March 27
5 years in 10 later than--	February 7	February 27	March 17
First freezing temperature in fall:			
1 year in 10 earlier than--	November 18	October 31	October 23
2 years in 10 earlier than--	November 27	November 8	October 29
5 years in 10 earlier than--	December 13	November 23	November 9

TABLE 3.--GROWING SEASON

[Data recorded in the period 1951-80
at Lufkin, Texas]

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	277	231	214
8 years in 10	288	243	222
5 years in 10	308	268	237
2 years in 10	328	292	251
1 year in 10	339	305	259

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AaB	Alazan very fine sandy loam, 0 to 4 percent slopes	41,950	7.6
Ab	Alazan-Besner complex, mounded	6,320	1.1
AcB	Alazan-Urban land complex, 0 to 4 percent slopes	2,690	0.5
AtB	Attoyac fine sandy loam, 0 to 4 percent slopes	1,970	0.4
AtD	Attoyac fine sandy loam, 8 to 15 percent slopes	1,900	0.3
BaB	Bernaldo fine sandy loam, 0 to 3 percent slopes	18,100	3.3
Bb	Bernaldo-Besner complex, gently undulating	3,330	0.6
BnB	Bienville loamy fine sand, 0 to 5 percent slopes	3,600	0.7
BrC	Browndell fine sandy loam, 2 to 5 percent slopes	175	0.1
BrD	Browndell fine sandy loam, 5 to 15 percent slopes	135	*
CoB	Corrigan fine sandy loam, 1 to 5 percent slopes	1,850	0.3
CtD	Cuthbert fine sandy loam, 5 to 15 percent slopes	6,800	1.2
CtF	Cuthbert fine sandy loam, 15 to 35 percent slopes	2,500	0.5
CuD	Cuthbert gravelly fine sandy loam, 8 to 15 percent slopes	930	0.2
DaC	Darco loamy fine sandy, 1 to 8 percent slopes	1,535	0.3
DaD	Darco loamy fine sand, 8 to 15 percent slopes	650	0.1
DbA	Diboll very fine sandy loam, 0 to 1 percent slopes	1,310	0.2
DbB	Diboll very fine sandy loam, 1 to 4 percent slopes	20,740	3.7
Du	Dumps	300	0.1
EtB	Etoile loam, 1 to 5 percent slopes	2,150	0.4
FfA	Fuller fine sandy loam, 0 to 1 percent slopes	1,910	0.3
FfB	Fuller fine sandy loam, 1 to 4 percent slopes	46,000	8.3
FuB	Fuller-Urban land complex, 1 to 4 percent slopes	4,730	0.9
HeA	Herty very fine sandy loam, 0 to 1 percent slopes	1,135	0.2
HeB	Herty very fine sandy loam, 1 to 5 percent slopes	12,600	2.3
HuB	Herty-Urban land complex, 1 to 5 percent slopes	65	*
Iu	Iuka fine sandy loam, occasionally flooded	2,820	0.5
KaB	Keithville very fine sandy loam, 0 to 3 percent slopes	2,130	0.4
Kb	Keithville-Sawtown complex, gently undulating	8,590	1.6
KcB	Keltys fine sandy loam, 1 to 5 percent slopes	41,590	7.5
KcD	Keltys fine sandy loam, 5 to 15 percent slopes	3,570	0.6
KdB	Keltys-Urban land complex, 1 to 5 percent slopes	1,860	0.3
KdD	Keltys-Urban land complex, 5 to 15 percent slopes	155	*
KfB	Kirvin fine sandy loam, 1 to 5 percent slopes	2,550	0.5
KgB	Kirvin gravelly fine sandy loam, 1 to 5 percent slopes	3,380	0.6
KhB	Kirvin soils, graded, 2 to 5 percent slopes	520	0.1
KmD	Kisatchie fine sandy loam, 5 to 15 percent slopes	1,280	0.2
Ko	Koury loam, occasionally flooded	15,180	2.7
Kp	Koury loam, frequently flooded	19,630	3.5
Ks	Koury-Urban land complex, occasionally flooded	810	0.1
KuB	Kurth fine sandy loam, 0 to 4 percent slopes	18,250	3.3
KwB	Kurth-Urban land complex, 0 to 4 percent slopes	2,180	0.4
LaB	Lacerda clay loam, 0 to 4 percent slopes	1,400	0.3
LeC	Letney loamy sand, 1 to 8 percent slopes	2,430	0.4
LtB	Lilbert loamy fine sand, 1 to 5 percent slopes	2,840	0.5
Ma	Mantachie clay loam, frequently flooded	6,180	1.1
Me	Marietta fine sandy loam, occasionally flooded	2,800	0.5
Mf	Marietta fine sandy loam, frequently flooded	2,610	0.5
MhB	Melhomes loamy sand, frequently flooded	560	0.1
MoA	Mollville loam, 0 to 1 percent slopes	220	0.1
Mp	Mollville-Besner complex, gently undulating	9,610	1.7
MsB	Moswell loam, 1 to 5 percent slopes	23,300	4.2
MsD	Moswell loam, 5 to 15 percent slopes	5,420	1.0
MuB	Moswell-Urban land complex, 1 to 5 percent slopes	210	0.1
Mx	Moten-Multey complex, gently undulating	9,680	1.7
NaD	Naclina clay, 5 to 15 percent slopes	1,000	0.2
Oz	Ozias silty clay, frequently flooded	23,500	4.2
Pa	Pits	140	0.1
Po	Pophers silty clay loam, frequently flooded	12,520	2.3
RaB	Rayburn fine sandy loam, 1 to 5 percent slopes	750	0.1
RaD	Rayburn fine sandy loam, 5 to 15 percent slopes	1,370	0.2
RkB	Raylake clay loam, 0 to 4 percent slopes	6,590	1.2

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
RnB	Rentzel loamy fine sand, 0 to 4 percent slopes	780	0.1
RoB	Rosenwall fine sandy loam, 1 to 5 percent slopes	17,600	3.2
RoD	Rosenwall fine sandy loam, 5 to 15 percent slopes	23,780	4.3
SaB	Sacul fine sandy loam, 1 to 5 percent slopes	10,300	1.9
SaD	Sacul fine sandy loam, 5 to 15 percent slopes	7,800	1.4
SbB	Sacul-Urban land complex, 1 to 5 percent slopes	130	*
StD	Stringtown fine sandy loam, 5 to 15 percent slopes	1,660	0.3
StF	Stringtown fine sandy loam, 15 to 35 percent slopes	1,600	0.3
TeD	Tehran loamy sand, 8 to 15 percent slopes	1,075	0.2
TnD	Tenaha loamy fine sand, 5 to 15 percent slopes	3,670	0.7
WoB	Woodtell very fine sandy loam, 1 to 5 percent slopes	12,650	2.3
WoD	Woodtell very fine sandy loam, 5 to 15 percent slopes	10,600	1.9
	Water	38,974	7.0
	Total	553,619	100.0

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Land capability	Improved bermudagrass	Common bermudagrass	Improved bahiagrass	Corn
		AUM*	AUM*	AUM*	Bu
AaB------ Alazan	IIw	10.0	6.0	9.0	90
Ab------ Alazan-Besner	IIw	10.0	6.0	9.0	90
AcB------ Alazan-Urban land	---	---	---	---	---
AtB------ Attoyac	IIe	12.0	8.0	8.0	90
AtD------ Attoyac	IVe	10.0	6.0	6.0	---
BaB------ Bernaldo	IIe	11.0	8.0	9.0	90
Bb------ Bernaldo-Besner	IIe	11.0	8.0	9.0	90
BnB------ Bienville	IIs	10.0	5.5	6.5	80
BrC------ Browndell	IVe	4.5	4.0	4.0	---
BrD------ Browndell	VIe	4.0	3.0	3.0	---
CoB------ Corrigan	IIIw	6.0	4.0	5.0	---
CtD------ Cuthbert	VIe	7.0	6.0	6.0	---
CtF------ Cuthbert	VIIe	---	---	---	---
CuD------ Cuthbert	VIe	6.0	5.0	5.0	---
DaC------ Darco	IIIs	6.0	3.0	---	45
DaD------ Darco	VIe	5.5	3.0	---	---
DbA------ Diboll	IIIw	8.0	5.0	8.0	75
DbB------ Diboll	IIIe	9.0	6.0	8.0	75
Du. Dumps					

See footnote at end of table.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Improved bermudagrass	Common bermudagrass	Improved bahiagrass	Corn
		AUM*	AUM*	AUM*	Bu
EtB: Etoile	IIIe	---	5.0	5.0	60
FfA: Fuller	IIIw	8.0	5.0	8.0	75
FfB: Fuller	IIIe	10.0	6.0	10.0	75
FuB: Fuller-Urban land	---	---	---	---	---
HeA: Herty	IIIw	6.0	4.0	5.0	---
HeB: Herty	IVe	6.0	5.0	5.0	---
HuB: Herty-Urban land	---	---	---	---	---
Iu: Iuka	IIw	9.0	7.0	8.5	110
KaB: Keithville	IIe	9.0	6.0	7.0	---
Kb: Keithville-Sawtown	IIe	9.0	6.0	7.0	---
KcB: Keltys	IIIe	12.0	7.0	9.0	90
KcD: Keltys	VIe	10.0	6.0	8.0	---
KdB: Keltys-Urban land	---	---	---	---	---
KdD: Keltys-Urban land	---	---	---	---	---
KfB: Kirvin	IIIe	9.0	7.0	8.0	80
KgB: Kirvin	IVe	7.0	5.0	5.0	80
KhB: Kirvin	VIe	5.0	3.0	4.0	---
KmD: Kisatchie	VIe	---	4.0	4.0	---
Ko: Koury	IIw	10.0	7.0	10.0	90
Kp: Koury	Vw	10.0	7.0	10.0	---

See footnote at end of table.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Improved bermudagrass	Common bermudagrass	Improved bahiagrass	Corn
		AUM*	AUM*	AUM*	Bu
Ks----------------------- Koury-Urban land	---	---	---	---	---
KuB---------------------- Kurth	IIIe	11.0	7.0	9.0	90
KwB---------------------- Kurth-Urban land	---	---	---	---	---
LaB---------------------- Lacerda	IIIe	5.0	4.0	4.0	45
LeC---------------------- Letney	IIIs	9.0	5.0	5.0	60
LtB---------------------- Lilbert	IIIs	10.0	6.0	6.0	75
Ma----------------------- Mantachie	Vw	6.0	5.0	6.0	---
Me----------------------- Marietta	IIw	11.0	7.0	10.5	90
Mf----------------------- Marietta	Vw	8.0	6.0	8.0	---
MhB---------------------- Melhomes	VIw	---	3.0	4.0	---
MoA---------------------- Mollville	IVw	---	4.0	5.0	---
Mp----------------------- Mollville-Besner	IVw	---	---	7.0	---
MsB---------------------- Moswell	IVe	6.0	5.0	6.0	---
MsD---------------------- Moswell	VIe	4.0	4.0	5.0	---
MuB---------------------- Moswell-Urban land	---	---	---	---	---
Mx----------------------- Moten-Multey	IIw	8.0	6.0	8.0	---
NaD---------------------- Naclina	VIe	7.5	4.0	6.0	---
Oz----------------------- Ozias	VIw	7.0	5.0	8.0	---
Pa. Pits					
Po----------------------- Pophers	Vw	8.0	5.0	6.0	---

See footnote at end of table.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Improved bermudagrass	Common bermudagrass	Improved bahiagrass	Corn
		AUM*	AUM*	AUM*	Bu
RaB----------------------- Rayburn	IVe	6.0	5.0	6.0	---
RaD----------------------- Rayburn	VIe	5.0	4.0	4.0	---
RkB----------------------- Raylake	IIIe	6.0	5.0	6.0	---
RnB----------------------- Rentzel	IIIw	9.0	6.0	8.0	---
RoB----------------------- Rosenwall	IVe	6.0	5.0	5.0	---
RoD----------------------- Rosenwall	VIe	5.0	4.0	4.0	---
SaB----------------------- Sacul	IIIe	7.0	6.0	6.0	---
SaD----------------------- Sacul	VIe	6.0	5.0	5.0	---
SbB----------------------- Sacul-Urban land	---	---	---	---	---
StD----------------------- Stringtown	VIe	8.0	6.0	6.0	---
StF----------------------- Stringtown	VIIe	---	---	---	---
TeD----------------------- Tehran	VIe	7.0	4.0	---	---
TnD----------------------- Tenaha	VIe	8.0	5.0	5.0	---
WoB----------------------- Woodtell	IIIe	7.5	6.5	6.5	---
WoD----------------------- Woodtell	VIe	6.0	5.5	5.5	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Productivity class*	
AaB------------- Alazan	9W	Slight	Moderate	Slight	Moderate	Loblolly pine-------	90	330	Loblolly pine, sweetgum.
						Shortleaf pine------	80	271	
						Sweetgum-----------	---	---	
						Southern red oak----	---	---	
Ab:									
Alazan---------	9W	Slight	Moderate	Slight	Moderate	Loblolly pine-------	90	330	Loblolly pine, sweetgum.
						Shortleaf pine------	80	271	
						Sweetgum-----------	---	---	
						Southern red oak----	---	---	
Besner---------	9A	Slight	Slight	Slight	Slight	Loblolly pine-------	90	330	Loblolly pine, slash pine, sweetgum.
						Shortleaf pine------	81	271	
						Sweetgum-----------	---	---	
						Southern red oak----	---	---	
AtB, AtD-------- Attoyac	9A	Slight	Slight	Slight	Slight	Loblolly pine-------	90	330	Loblolly pine, slash pine, American sycamore, black walnut, southern red oak.
						Shortleaf pine------	84	271	
						Sweetgum-----------	90	207	
						Southern red oak----	80	109	
BaB------------- Bernaldo	9A	Slight	Slight	Slight	Slight	Loblolly pine-------	90	330	Loblolly pine, sweetgum, southern red oak.
						Shortleaf pine------	80	271	
						Sweetgum-----------	---	---	
						Southern red oak----	---	---	
Bb:									
Bernaldo-------	9A	Slight	Slight	Slight	Slight	Loblolly pine-------	90	330	Loblolly pine, sweetgum, southern red oak.
						Shortleaf pine------	80	271	
						Sweetgum-----------	---	---	
						Southern red oak----	---	---	
Besner---------	9A	Slight	Slight	Slight	Slight	Loblolly pine-------	90	330	Loblolly pine, sweetgum, southern red oak.
						Shortleaf pine------	81	271	
						Sweetgum-----------	---	---	
						Southern red oak----	---	---	
BnB------------- Bienville	9S	Slight	Moderate	Moderate	Moderate	Loblolly pine-------	90	330	Loblolly pine.
						Shortleaf pine------	85	271	
BrC, BrD-------- Browndell	5D	Moderate	Moderate	Severe	Slight	Loblolly pine-------	60	60	Loblolly pine, shortleaf pine, longleaf pine, sweetgum, green ash.
						Shortleaf pine------	50	52	
						Longleaf pine-------	50	---	
						Sweetgum-----------	---	---	
						Ash----------------	---	---	

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Productivity class*	
CoB: Corrigan	8C	Moderate	Moderate	Moderate	Slight	Loblolly pine	84	230	Loblolly pine, shortleaf pine, longleaf pine, sweetgum.
						Shortleaf pine	70	173	
						Longleaf pine	80	150	
						Sweetgum	---	---	
CtD: Cuthbert	8C	Moderate	Moderate	Slight	Slight	Loblolly pine	84	230	Loblolly pine.
						Shortleaf pine	68	173	
CtF: Cuthbert	6R	Severe	Severe	Moderate	Slight	Loblolly pine	70	130	Loblolly pine.
						Shortleaf pine	60	87	
CuD: Cuthbert	6F	Moderate	Moderate	Moderate	Slight	Loblolly pine	70	130	Loblolly pine.
						Shortleaf pine	60	87	
DaC, DaD: Darco	8S	Slight	Moderate	Severe	Moderate	Loblolly pine	81	230	Loblolly pine, shortleaf pine.
						Shortleaf pine	68	173	
DbA, DbB: Diboll	8W	Slight	Moderate	Severe	Moderate	Loblolly pine	80	230	Loblolly pine, longleaf pine, water oak.
						Shortleaf pine	70	173	
						Water oak	---	---	
						Southern red oak	---	---	
						Willow oak	80	---	
						Elm	---	---	
Etb: Etoile	7C	Slight	Moderate	Slight	Moderate	Loblolly pine	74	130	Loblolly pine, green ash.
						Shortleaf pine	65	87	
						Green ash	---	---	
FfA, FfB: Fuller	8W	Slight	Moderate	Severe	Moderate	Loblolly pine	80	230	Loblolly pine, longleaf pine, water oak.
						Shortleaf pine	70	173	
						Sweetgum	80	117	
HeA, HeB: Herty	8C	Slight	Moderate	Moderate	Moderate	Loblolly pine	80	230	Loblolly pine, water oak, southern red oak.
						Shortleaf pine	70	173	
						Water oak	80	---	
						Southern red oak	70	78	
						Post oak	---	---	
Iu: Iuka	11W	Slight	Moderate	Moderate	Moderate	Loblolly pine	100	460	Loblolly pine, eastern cottonwood.
						Sweetgum	100	305	
						Eastern cottonwood	105	---	
						Water oak	100	---	
Kab: Keithville	9W	Slight	Moderate	Slight	Moderate	Loblolly pine	90	330	Loblolly pine, sweetgum.
						Shortleaf pine	80	271	
						Sweetgum	---	---	
						Southern red oak	---	---	
Kb: Keithville	9W	Slight	Moderate	Slight	Moderate	Loblolly pine	90	330	Loblolly pine, sweetgum.
						Shortleaf pine	80	271	
						Sweetgum	---	---	
						Southern red oak	---	---	
Sawtown	9A	Slight	Slight	Slight	Slight	Loblolly pine	90	330	Loblolly pine, sweetgum, southern red oak.
						Shortleaf pine	80	271	
						Southern red oak	---	---	

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
KcB, KcD: Keltys	9A	Slight	Slight	Slight	Slight	Loblolly pine	90	230	Loblolly pine, sweetgum, southern red oak.
						Shortleaf pine	80	271	
						Sweetgum	---	---	
						Southern red oak	---	---	
KfB: Kirvin	8A	Slight	Slight	Slight	Slight	Loblolly pine	83	230	Loblolly pine.
						Shortleaf pine	72	173	
KgB: Kirvin	6F	Moderate	Moderate	Slight	Slight	Loblolly pine	70	130	Loblolly pine.
						Shortleaf pine	60	87	
KhB: Kirvin	6C	Severe	Moderate	Severe	Slight	Loblolly pine	70	130	Loblolly pine.
						Shortleaf pine	57	87	
KmD: Kisatchie	8C	Moderate	Moderate	Moderate	Slight	Loblolly pine	85	230	Loblolly pine, longleaf pine.
						Slash pine	---	---	
						Longleaf pine	---	---	
						Shortleaf pine	---	---	
Ko, Kp: Koury	11W	Slight	Moderate	Slight	Moderate	Loblolly pine	100	460	Loblolly pine, sweetgum, water oak, green ash.
						Sweetgum	100	305	
						Blackgum	90	---	
						Water oak	90	---	
KuB: Kurth	9A	Slight	Slight	Slight	Slight	Loblolly pine	90	330	Loblolly pine, sweetgum, water oak.
						Shortleaf pine	80	271	
						Sweetgum	90	207	
						Water oak	80	---	
						Southern red oak	80	109	
LaB: Lacerda	8C	Slight	Moderate	Slight	Moderate	Loblolly pine	80	230	Loblolly pine, green ash.
						Shortleaf pine	70	173	
						Southern red oak	---	---	
						Sweetgum	---	---	
LeC: Letney	9S	Slight	Moderate	Moderate	Moderate	Loblolly pine	86	330	Loblolly pine, longleaf pine.
						Shortleaf pine	---	---	
						Longleaf pine	81	117	
LtB: Lilbert	9S	Slight	Slight	Moderate	Moderate	Loblolly pine	85	330	Loblolly pine.
						Shortleaf pine	74	173	
						Longleaf pine	70	90	
Ma: Mantachie	8W	Slight	Severe	Severe	Severe	Sweetgum	95	207	Green ash, eastern cottonwood, cherrybark oak, sweetgum.
						Cherrybark oak	100	---	
						Eastern cottonwood	90	---	
						Green ash	80	---	
Me: Marietta	11W	Slight	Moderate	Moderate	Moderate	Loblolly pine	100	460	Loblolly pine, eastern cottonwood, sweetgum, green ash, American sycamore.
						Eastern cottonwood	105	---	
						Green ash	90	---	
						Sweetgum	100	305	
						American sycamore	105	---	

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
Mf----------- Marietta	11W	Slight	Moderate	Severe	Slight	Loblolly pine-------	100	460	Loblolly pine, eastern cottonwood, sweetgum, green ash, American sycamore.
						Eastern cottonwood--	105	---	
						Green ash-----------	90	---	
						Sweetgum------------	100	305	
						American sycamore---	105	---	
MhB------------ Melhomes	7W	Slight	Severe	Severe	Severe	Loblolly pine-------	73	130	Loblolly pine, sweetgum, water oak.
						Sweetgum------------	---	---	
MoA------------ Mollville	6W	Slight	Severe	Moderate	Severe	Sweetgum------------	80	117	Water oak, sweetgum.
						Water oak-----------	80	---	
						Willow oak----------	80	---	
Mp:									
Mollville------	6W	Slight	Severe	Moderate	Severe	Sweetgum------------	80	117	Water oak, sweetgum.
						Water oak-----------	80	---	
						Willow oak----------	80	---	
Besner---------	9A	Slight	Slight	Slight	Slight	Loblolly pine-------	90	330	Loblolly pine, sweetgum.
						Shortleaf pine------	81	271	
						Sweetgum------------	---	---	
						Southern red oak----	---	---	
MsB, MsD-------- Moswell	8C	Slight	Moderate	Slight	Slight	Loblolly pine-------	80	230	Loblolly pine.
						Shortleaf pine------	70	173	
Mx:									
Moten----------	8W	Slight	Moderate	Moderate	Moderate	Loblolly pine-------	80	230	Loblolly pine, water oak.
						Shortleaf pine------	70	173	
						Water oak-----------	80	---	
Multey---------	9A	Slight	Slight	Slight	Slight	Loblolly pine-------	90	330	Loblolly pine, sweetgum, southern red oak.
						Sweetgum------------	90	207	
						Southern red oak----	80	109	
NaD------------ Naclina	6C	Slight	Moderate	Moderate	Moderate	Loblolly pine-------	68	130	Loblolly pine, shortleaf pine, southern red oak, green ash.
						Shortleaf pine------	60	87	
						Southern red oak----	60	54	
						Sweetgum------------	68	52	
Oz------------- Ozias	10W	Slight	Severe	Severe	Moderate	Sweetgum------------	100	305	Water oak, willow oak.
						Water oak-----------	100	---	
						Overcup oak---------	---	---	
						Winged elm----------	---	---	
						Green ash-----------	---	---	
						Overcup oak---------	---	---	
Po------------- Pophers	8W	Slight	Severe	Severe	Moderate	Sweetgum------------	95	207	Water oak, green ash, sweetgum.
						Water oak-----------	107	---	
						Green ash-----------	---	---	
						Sugarberry----------	---		

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Productivity class*	Trees to plant
RaB, RaD-------- Rayburn	9C	Moderate	Moderate	Moderate	Moderate	Loblolly pine------- Shortleaf pine------ Longleaf pine------- Sweetgum------------	87 --- 74 ---	330 --- 52 ---	Loblolly pine, longleaf pine, sweetgum.
RkB------------- Raylake	8C	Slight	Moderate	Moderate	Moderate	Loblolly pine------- Shortleaf pine------ Southern red oak---- Sweetgum------------	79 --- --- ---	230 --- --- ---	Loblolly pine, sweetgum.
RnB------------- Rentzel	9W	Slight	Moderate	Moderate	Moderate	Loblolly pine------- Shortleaf pine------ Sweetgum------------	89 76 ---	330 271 ---	Loblolly pine, sweetgum, water oak.
RoB, RoD-------- Rosenwall	7C	Slight	Moderate	Slight	Slight	Loblolly pine------- Shortleaf pine------	76 68	130 87	Loblolly pine.
SaB, SaD-------- Sacul	8C	Moderate	Slight	Slight	Moderate	Loblolly pine------- Shortleaf pine------	80 70	230 173	Loblolly pine, shortleaf pine.
StD------------- Stringtown	9A	Slight	Slight	Slight	Slight	Loblolly pine------- Longleaf pine------- Sweetgum------------ Southern red oak----	87 82 --- ---	330 150 --- ---	Loblolly pine, longleaf pine, sweetgum, southern red oak.
StF------------- Stringtown	6R	Severe	Moderate	Slight	Slight	Loblolly pine------- Longleaf pine------- Sweetgum------------ Southern red oak---- Shortleaf pine------	69 68 --- --- ---	130 90 --- --- ---	Loblolly pine, longleaf pine, sweetgum, southern red oak.
TeD------------- Tehran	8S	Slight	Moderate	Severe	Moderate	Loblolly pine------- Shortleaf pine------ Longleaf pine-------	83 --- ---	230 --- ---	Loblolly pine, longleaf pine.
TnD------------- Tenaha	8S	Slight	Slight	Moderate	Slight	Loblolly pine------- Shortleaf pine------	80 70	230 173	Loblolly pine.
WoB, WoD-------- Woodtell	7C	Slight	Moderate	Moderate	Moderate	Loblolly pine------- Shortleaf pine------	74 65	130 87	Loblolly pine.

* Productivity class is the yield in board feet (Doyle Rule) per acre, per year over a 50 year period for fully stocked natural stands.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION

Woodland ordination group symbols *	11W	10W	9A	9C	9S	9W	8A	8C	8S	8W	7C	7W	6C	6F	6R	6W	5D
Average annual production lbs/acre air dry (35-55 pct canopy and normal rainfall)	1,500	1,200	1,200	1,600	1,200	1,600	1,300	1,800	1,200	1,700	1,650	1,750	1,750	1,750	1,700	1,400	1,100
Vegetation common to the site **																	
Bracken fern----------	1	---	1	1	2	1	1	1	2	1	1	---	1	1	1	---	1
Bluestem, big---------	---	---	1	3	1	---	1	3	---	---	3	---	3	3	1	---	---
Bluestem, broomsedge--	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Bluestem, bushy-------	---	2	---	---	---	---	---	---	---	1	---	2	---	---	---	2	---
Bluestem, fineleaf----	1	---	1	1	1	1	1	1	1	1	1	1	1	1	1	---	1
Bluestem, slender-----	1	---	1	1	1	1	1	1	1	---	1	---	1	1	1	---	1
Bluestem, splitbeard--	1	---	1	1	1	1	1	1	1	1	1	1	1	1	1	---	1
Bluestem, pinehill----	5	2	5	5	5	5	5	5	5	4	5	4	5	5	5	2	5
Bearded skeletongrass	---	---	1	---	---	---	1	1	---	---	---	---	1	1	1	---	1
Carpetgrass-----------	1	2	1	1	---	1	---	---	---	1	1	2	---	---	---	2	---
Carolina jointtail----	1	1	1	1	---	1	---	---	---	1	1	1	---	---	---	1	---
Cutover muhly---------	1	---	2	1	2	1	2	2	2	1	2	---	2	2	1	---	---
Indiangrass-----------	---	---	1	1	1	---	1	1	---	---	1	---	1	1	1	---	---
Eastern gammagrass----	1	---	1	1	---	1	1	1	---	1	1	1	1	1	---	---	---
Longleaf uniola-------	2	1	2	2	2	2	1	2	1	2	2	2	2	2	2	1	1
Longspike tridens-----	---	1	---	---	---	---	---	---	---	---	---	1	---	---	---	1	---
Panicum, beaked-------	2	2	1	---	---	2	---	---	---	---	---	2	---	---	---	2	---
Panicum, spreading----	2	2	1	---	---	2	---	---	---	2	---	2	---	---	---	2	---
Panicums, low---------	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Paspalum, brownseed---	2	---	2	2	2	2	2	2	2	1	2	---	2	2	2	---	1
Paspalum, fringeleaf--	---	---	---	---	1	---	1	1	2	---	---	---	---	---	1	---	1
Paspalum, Florida-----	1	1	---	1	---	1	---	---	---	1	---	1	---	---	---	1	---
Pineywoods dropseed---	1	---	2	1	2	1	2	2	2	1	2	---	2	2	1	---	---
Purple lovegrass------	---	---	1	---	1	---	1	1	1	---	1	---	1	1	1	---	---
Purpletop tridens-----	1	---	1	1	1	1	1	1	1	1	1	---	1	1	1	---	---
Shaggy crabgrass------	---	---	---	---	1	---	1	---	2	---	---	---	---	---	---	---	---
Switchcane------------	1	3	---	1	---	1	---	---	---	1	---	2	---	---	---	3	---
Switchgrass-----------	2	2	1	2	---	2	1	2	---	2	2	2	2	2	---	2	---
Threeawns-------------	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wildrye---------------	2	2	1	1	---	2	1	1	---	2	1	1	1	1	---	2	---

See footnotes at end of table.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION--Continued

Woodland ordination group symbols *	11W	10W	9A	9C	9S	9W	8A	8C	8S	8W	7C	7W	6C	6F	6R	6W	5D
Average annual production lbs/acre air dry (35-55 pct canopy and normal rainfall)	1,500	1,200	1,200	1,600	1,200	1,600	1,300	1,800	1,200	1,700	1,650	1,750	1,750	1,750	1,700	1,400	1,100
Sedges	1	3	1	1	1	1	1	1	1	2	2	3	2	2	1	3	2
Rushes	---	1	---	---	---	---	---	---	---	---	---	1	---	---	---	1	---
Alabama supplejack	1	2	---	1	---	1	---	---	---	1	1	2	---	---	---	2	---
Blackberry	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dewberry	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Grape, muscadine	1	1	1	1	1	1	1	1	---	1	1	1	1	1	---	1	---
Grape, sandflat	---	---	---	---	1	---	---	---	2	---	---	---	---	---	---	---	---
Grape, other species	1	1	1	1	---	1	---	1	---	1	1	---	1	1	---	1	---
Greenbrier	2	2	2	1	1	2	1	1	1	2	1	2	1	1	1	2	1
Honeysuckle	1	---	1	1	1	1	1	1	1	1	1	1	1	1	1	---	1
Poison ivy	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Pepper vine	1	1	1	1	---	1	---	---	---	1	1	1	---	---	---	1	---
Virginia creeper	1	---	1	1	---	1	---	---	---	1	1	---	---	---	---	---	---
Yellow jassamine	1	---	1	1	1	1	1	1	1	1	1	---	1	1	1	---	1
Yucca	---	---	---	---	1	---	---	---	1	---	---	---	---	---	---	---	---
Palmetto	---	1	---	---	---	---	---	---	---	---	---	1	---	---	---	1	---
Aster, grassleaf	1	---	1	1	1	1	1	1	---	1	1	---	1	1	1	---	1
Croton	1	---	1	1	1	1	1	1	1	1	1	---	1	1	1	---	1
Gayfeather	1	---	1	1	---	1	---	---	---	1	1	---	---	---	---	---	---
Goldenrod	1	1	---	1	---	1	---	---	---	1	1	1	---	---	---	1	---
Slender biglowia	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2
St. Andrews cross	1	---	1	1	1	1	1	---	---	1	1	1	---	---	1	---	---
Smartweed	---	1	---	---	---	---	---	---	---	---	---	1	---	---	---	1	---
Sumpweed	---	1	---	---	---	---	---	---	---	---	1	1	---	---	---	1	---
Tickclover	1	---	1	1	1	1	1	1	1	1	1	---	1	1	1	---	1
Virginia tephrosia	---	---	---	---	1	---	---	---	1	---	---	---	---	---	---	---	---
American beautyberry	1	---	1	1	1	1	1	1	1	1	1	---	1	1	1	---	1
Buttonbush	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	1	---
Bacchris	1	2	---	1	1	1	---	---	---	1	1	1	---	---	---	2	---
Dogwood flowering	1	---	1	---	2	1	1	1	2	---	---	---	1	1	1	---	---

See footnotes at end of table.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION--Continued

Woodland ordination group symbols *	11W	10W	9A	9C	9S	9W	8A	8C	8S	8W	7C	7W	6C	6F	6R	6W	5D
Average annual production lbs/acre air dry (35-55 pct canopy and normal rainfall)	1,500	1,200	1,200	1,600	1,200	1,600	1,300	1,800	1,200	1,700	1,650	1,750	1,750	1,750	1,700	1,400	1,100
Hawthorns-------------	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Huckleberry-----------	1	---	1	1	---	1	---	1	---	1	1	---	1	1	---	---	---
Holly, American-------	1	1	1	1	---	1	---	---	---	1	1	1	---	---	---	1	---
Persimmon-------------	1	1	---	---	1	1	---	---	1	1	1	1	1	1	1	1	---
Sassafras-------------	---	---	1	---	1	---	1	---	2	---	---	---	---	---	1	---	1
Sumac-----------------	---	---	1	1	1	---	1	1	1	---	1	---	1	1	1	---	1
Swamp cyrilla---------	1	1	---	---	---	1	---	---	---	1	---	1	---	---	---	1	---
Wax myrtle------------	1	2	---	---	---	1	---	---	---	1	1	2	---	---	---	2	---
Yaupon----------------	1	---	1	---	1	1	1	1	1	---	---	---	---	---	1	---	1

* The woodland ordination group symbol for each soil is shown at the end of each map unit description and in table 6.--Woodland Management and Productivity.

** 1 indicates that the named plant occurs on the soil in an amount less than 5 percent.
2 indicates that the named plant occurs on the soil in an amount of 5 to 10 percent.
3 indicates that the named plant occurs on the soil in an amount of 10 to 25 percent.
4 indicates that the named plant occurs on the soil in an amount of 25 to 50 percent.
5 indicates that the named plant occurs on the soil in an amount of 50 percent or more.
Absence of an entry indicates that the named plant does not occur on the soil.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AaB------------------- Alazan	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
Ab:					
Alazan---------------	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Besner---------------	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
AcB:					
Alazan---------------	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
AtB------------------- Attoyac	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
AtD------------------- Attoyac	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
BaB------------------- Bernaldo	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
Bb:					
Bernaldo-------------	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
Besner---------------	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
BnB------------------- Bienville	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
BrC------------------- Browndell	Severe: percs slowly, depth to rock.	Severe: percs slowly, depth to rock.	Severe: depth to rock, percs slowly.	Slight----------	Severe: depth to rock.
BrD------------------- Browndell	Severe: percs slowly, depth to rock.	Severe: percs slowly, depth to rock.	Severe: slope, percs slowly, depth to rock.	Severe: erodes easily.	Severe: depth to rock.
CoB------------------- Corrigan	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
CtD------------------- Cuthbert	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty.
CtF------------------- Cuthbert	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Moderate: droughty.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CuD------------------- Cuthbert	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope, small stones.	Slight-----------	Moderate: small stones, droughty.
DaC------------------- Darco	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Moderate: droughty.
DaD------------------- Darco	Moderate: too sandy, slope.	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy.	Moderate: slope, droughty.
DbA, DbB-------------- Diboll	Severe: wetness, percs slowly, excess sodium.	Severe: wetness, excess sodium, percs slowly.	Severe: wetness, percs slowly, excess sodium.	Severe: wetness.	Severe: wetness, excess sodium.
Du. Dumps					
EtB------------------- Etoile	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
FfA, FfB-------------- Fuller	Severe: wetness, percs slowly, excess sodium.	Severe: wetness, excess sodium, percs slowly.	Severe: wetness, percs slowly, excess sodium.	Severe: wetness.	Severe: excess sodium, wetness.
FuB: Fuller---------------	Severe: wetness, percs slowly, excess sodium.	Severe: wetness, excess sodium, percs slowly.	Severe: wetness, percs slowly, excess sodium.	Severe: wetness.	Severe: excess sodium, wetness.
Urban land.					
HeA, HeB-------------- Herty	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
HuB: Herty----------------	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Urban land.					
Iu-------------------- Iuka	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
KaB------------------- Keithville	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Slight.
Kb: Keithville-----------	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Slight.
Sawtown--------------	Slight----------	Slight----------	Slight----------	Slight----------	Slight.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
KcB------------------ Keltys	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
KcD------------------ Keltys	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
KdB:					
Keltys---------------	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
Urban land.					
KdD:					
Keltys---------------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Urban land.					
KfB------------------ Kirvin	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope.	Slight----------	Slight.
KgB------------------ Kirvin	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight----------	Severe: small stones.
KhB------------------ Kirvin	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Moderate: slope, small stones.	Slight----------	Slight.
KmD------------------ Kisatchie	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope, thin layer.
Ko------------------- Koury	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding, percs slowly.	Moderate: wetness.	Moderate: wetness, flooding.
Kp------------------- Koury	Severe: flooding.	Moderate: flooding, wetness, percs slowly.	Severe: flooding.	Moderate: wetness, flooding.	Severe: flooding.
Ks:					
Koury----------------	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding, percs slowly.	Moderate: wetness.	Moderate: wetness, flooding.
Urban land.					
KuB------------------ Kurth	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
KwB:					
Kurth	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
Urban land.					
LaB	Severe: percs slowly, wetness.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.
Lacerda					
LeC	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
Letney					
LtB	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Moderate: droughty.
Lilbert					
Ma	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
Mantachie					
Me	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: flooding, wetness.
Marietta					
Mf	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.
Marietta					
MhB	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, droughty, flooding.
Melhomes					
MoA	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Mollville					
Mp:					
Mollville	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Besner	Slight	Slight	Slight	Slight	Slight.
MsB	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
Moswell					
MsD	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
Moswell					
MuB:					
Moswell	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
Urban land.					
Mx:					
Moten	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Mx:					
Multey	Slight	Slight	Slight	Slight	Slight.
NaD Naclina	Severe: wetness, percs slowly.	Severe: wetness, too clayey.	Severe: slope, too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
Oz Ozias	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, flooding.	Severe: too clayey.	Severe: flooding, too clayey.
Pa. Pits					
Po Pophers	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
RaB Rayburn	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
RaD Rayburn	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
RkB Raylake	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
RnB Rentzel	Moderate: wetness, percs slowly, too sandy.	Moderate: wetness, percs slowly, too sandy.	Moderate: slope, too sandy, wetness.	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.
RoB Rosenwall	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Moderate: depth to rock.
RoD Rosenwall	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope, depth to rock.
SaB Sacul	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
SaD Sacul	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
SbB:					
Sacul	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
Urban land.					
StD Stringtown	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
StF------------------- Stringtown	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
TeD------------------- Tehran	Moderate: slope, too sandy.	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
TnD------------------- Tenaha	Moderate: too sandy, slope.	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
WoB------------------- Woodtell	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight-----------	Slight.
WoD------------------- Woodtell	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.

TABLE 9.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AaB---------------- Alazan	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
Ab:										
Alazan------------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
Besner------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AcB:										
Alazan------------	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
Urban land.										
AtB---------------- Attoyac	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AtD---------------- Attoyac	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BaB---------------- Bernaldo	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Bb:										
Bernaldo----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Besner------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BnB---------------- Bienville	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
BrC, BrD----------- Browndell	Poor	Poor	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Poor
CoB---------------- Corrigan	Fair	Fair	Good	Good	Good	Fair	Very poor.	Fair	Good	Very poor.
CtD---------------- Cuthbert	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CtF---------------- Cuthbert	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CuD---------------- Cuthbert	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
DaC---------------- Darco	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
DaD---------------- Darco	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
DbA, DbB----------- Diboll	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair

TABLE 9.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Du. Dumps										
EtB----------------- Etoile	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
FfA, FfB----------- Fuller	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
FuB:										
Fuller------------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
Urban land.										
HeA, HeB----------- Herty	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor
HuB:										
Herty-------------	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor
Urban land.										
Iu----------------- Iuka	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
KaB---------------- Keithville	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
Kb:										
Keithville--------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
Sawtown-----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KcB, KcD----------- Keltys	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KdB, KdD:										
Keltys------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
KfB---------------- Kirvin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KgB---------------- Kirvin	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KhB---------------- Kirvin	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
KmD---------------- Kisatchie	Poor	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Ko, Kp------------- Koury	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair	Good	Fair
Ks:										
Koury-------------	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair	Good	Fair

TABLE 9.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ks: Urban land.										
KuB: Kurth	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
KwB: Kurth	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
Urban land.										
LaB: Lacerda	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
LeC: Letney	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
LtB: Lilbert	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Ma: Mantachie	Poor	Fair	Fair	Good	Fair	Fair	Fair	Fair	Good	Fair
Me: Marietta	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
Mf: Marietta	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor
MhB: Melhomes	Very poor.	Poor	Fair	Fair	Fair	Fair	Good	Poor	Fair	Fair
MoA: Mollville	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good
Mp: Mollville	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good
Besner	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MsB: Moswell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MsD: Moswell	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Fair	Very poor.
MuB: Moswell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
Mx: Moten	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good
Multey	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor.

TABLE 9.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
NaD----------------- Naclina	Fair	Fair	Fair	Good	Good	Fair	Very poor.	Fair	Good	Very poor.
Oz------------------ Ozias	Poor	Fair	Fair	Fair	Very poor.	Fair	Good	Fair	Fair	Good
Pa. Pits										
Po------------------ Pophers	Fair	Fair	Fair	Good	Poor	Fair	Fair	Fair	Good	Fair
RaB, RaD------------ Rayburn	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RkB----------------- Raylake	Fair	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair
RnB----------------- Rentzel	Poor	Fair	Good	Good	Good	Fair	Poor	Fair	Good	Poor
RoB----------------- Rosenwall	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor
RoD----------------- Rosenwall	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SaB----------------- Sacul	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SaD----------------- Sacul	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SbB: Sacul--------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
StD----------------- Stringtown	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
StF----------------- Stringtown	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
TeD----------------- Tehran	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
TnD----------------- Tenaha	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WoB----------------- Woodtell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor
WoD----------------- Woodtell	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AaB: Alazan	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
Ab:						
Alazan	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
Besner	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Slight	Slight.
AcB:						
Alazan	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
Urban land.						
AtB: Attoyac	Slight	Slight	Slight	Slight	Moderate: low strength.	Slight.
AtD: Attoyac	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
BaB: Bernaldo	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Bb:						
Bernaldo	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Besner	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Slight	Slight.
BnB: Bienville	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty.
BrC: Browndell	Severe: depth to rock.	Severe: shrink-swell.	Severe: shrink-swell, depth to rock.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: depth to rock.
BrD: Browndell	Severe: depth to rock.	Severe: shrink-swell.	Severe: shrink-swell, depth to rock.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Severe: depth to rock.
CoB: Corrigan	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
CtD: Cuthbert	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: droughty.
CtF: Cuthbert	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Moderate: droughty.
CuD: Cuthbert	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: small stones, droughty.
DaC: Darco	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
DaD: Darco	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope, droughty.
DbA, DbB: Diboll	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, excess sodium.
Du. Dumps						
EtB: Etoile	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness.	Severe: wetness.
FfA, FfB: Fuller	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: excess sodium, wetness.
FuB: Fuller	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: excess sodium, wetness.
Urban land.						
HeA, HeB: Herty	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
HuB: Herty	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Urban land.						
Iu: Iuka	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.
KaB: Keithville	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Slight.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Kb:						
Keithville	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Slight.
Sawtown	Moderate: too clayey, wetness.	Slight	Severe: shrink-swell.	Slight	Slight	Slight.
KcB: Keltys	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Slight	Slight.
KcD: Keltys	Moderate: slope, wetness.	Moderate: slope.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope.	Moderate: slope.
KdB:						
Keltys	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Slight	Slight.
Urban land.						
KdD:						
Keltys	Moderate: slope, wetness.	Moderate: slope.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope.	Moderate: slope.
Urban land.						
KfB: Kirvin	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
KgB: Kirvin	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: small stones.
KhB: Kirvin	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
KmD: Kisatchie	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope, thin layer.
Ko: Koury	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: wetness, flooding.
Kp: Koury	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Ks:						
Koury	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: wetness, flooding.
Urban land.						
KuB: Kurth	Moderate: wetness.	Slight	Moderate: wetness, shrink-swell.	Slight	Slight	Slight.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
KwB:						
Kurth	Moderate: wetness.	Slight	Moderate: wetness, shrink-swell.	Slight	Slight	Slight.
Urban land.						
LaB Lacerda	Severe: wetness, cutbanks cave.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, too clayey.
LeC Letney	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
LtB Lilbert	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
Ma Mantachie	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.
Me Marietta	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: flooding, wetness.
Mf Marietta	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.
MhB Melhomes	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.
MoA Mollville	Severe: ponding, cutbanks cave.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Mp:						
Mollville	Severe: ponding, cutbanks cave.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Besner	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Slight	Slight.
MsB Moswell	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
MsD Moswell	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
MuB:						
Moswell	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Urban land.						
Mx:						
Moten	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Multey	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Slight	Slight.
NaD Naclina	Severe: cutbanks cave, wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: low strength, wetness.	Severe: wetness, too clayey.
Oz Ozias	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, flooding, shrink-swell.	Severe: flooding, too clayey.
Pa. Pits						
Po Pophers	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: flooding.
RaB Rayburn	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
RaD Rayburn	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
RkB Raylake	Severe: cutbanks cave, wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
RnB Rentzel	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, too sandy.
RoB Rosenwall	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: depth to rock.
RoD Rosenwall	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope, depth to rock.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SaB---------------- Sacul	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
SaD---------------- Sacul	Moderate: too clayey, slope, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
SbB:						
Sacul-------------	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Urban land.						
StD---------------- Stringtown	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
StF---------------- Stringtown	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
TeD---------------- Tehran	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
TnD---------------- Tenaha	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
WoB---------------- Woodtell	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
WoD---------------- Woodtell	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AaB: Alazan	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
Ab:					
Alazan	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
Besner	Moderate: wetness.	Severe: seepage.	Severe: wetness.	Severe: seepage.	Good.
AcB:					
Alazan	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
Urban land.					
AtB: Attoyac	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
AtD: Attoyac	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
BaB: Bernaldo	Moderate: wetness.	Moderate: seepage.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
Bb:					
Bernaldo	Moderate: wetness.	Moderate: seepage.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
Besner	Moderate: wetness.	Severe: seepage.	Severe: wetness.	Severe: seepage.	Good.
BnB: Bienville	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Fair: too sandy.
BrC: Browndell	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
BrD: Browndell	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
CoB: Corrigan	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too clayey.	Severe: depth to rock, wetness.	Poor: depth to rock, too clayey, hard to pack.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CtD----------------- Cuthbert	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
CtF----------------- Cuthbert	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, slope.
CuD----------------- Cuthbert	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
DaC----------------- Darco	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Fair: too sandy.
DaD----------------- Darco	Severe: poor filter.	Severe: seepage, slope.	Moderate: too sandy.	Severe: seepage.	Fair: too sandy.
DbA, DbB------------ Diboll	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, wetness, excess sodium.	Severe: wetness.	Poor: wetness, excess sodium.
Du. Dumps					
EtB----------------- Etoile	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
FfA, FfB------------ Fuller	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, wetness, excess sodium.	Severe: wetness.	Poor: wetness, excess sodium.
FuB:					
Fuller--------------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, wetness, excess sodium.	Severe: wetness.	Poor: wetness, excess sodium.
Urban land.					
HeA----------------- Herty	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
HeB----------------- Herty	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
HuB:					
Herty---------------	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Urban land.					

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Iu: Iuka	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
KaB: Keithville	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Poor: thin layer.
Kb:					
Keithville	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Poor: thin layer.
Sawtown	Severe: wetness, percs slowly.	Severe: seepage.	Moderate: wetness.	Severe: seepage.	Good.
KcB: Keltys	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock.	Moderate: wetness, depth to rock.	Fair: depth to rock, wetness.
KcD: Keltys	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: depth to rock.	Moderate: slope, wetness, depth to rock.	Fair: slope, depth to rock, wetness.
KdB:					
Keltys	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock.	Moderate: wetness, depth to rock.	Fair: depth to rock, wetness.
Urban land.					
KdD:					
Keltys	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: depth to rock.	Moderate: slope, wetness, depth to rock.	Fair: slope, depth to rock, wetness.
Urban land.					
KfB, KgB, KhB: Kirvin	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
KmD: Kisatchie	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
Ko, Kp: Koury	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Ks:					
Koury	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ks:					
Urban land.					
KuB: Kurth	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock.	Moderate: depth to rock, wetness.	Fair: depth to rock, wetness.
KwB:					
Kurth	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock.	Moderate: depth to rock, wetness.	Fair: depth to rock, wetness.
Urban land.					
LaB: Lacerda	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
LeC: Letney	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
LtB: Lilbert	Moderate: percs slowly.	Severe: seepage.	Slight	Severe: seepage.	Good.
Ma: Mantachie	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Me, Mf: Marietta	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
MhB: Melhomes	Severe: flooding, wetness, poor filter.	Severe: seepage, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness, seepage.	Poor: seepage, too sandy, wetness.
MoA: Mollville	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Mp:					
Mollville	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Besner	Moderate: wetness.	Severe: seepage.	Severe: wetness.	Severe: seepage.	Good.
MsB: Moswell	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
MsD: Moswell	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness, too clayey.	Moderate: slope, wetness.	Poor: too clayey, hard to pack.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MuB:					
Moswell	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Urban land.					
Mx:					
Moten	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Multey	Severe: wetness.	Severe: wetness.	Severe: seepage.	Moderate: wetness.	Fair: wetness.
NaD: Naclina	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
Oz: Ozias	Severe: flooding, percs slowly, wetness.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, wetness, hard to pack.
Pa. Pits					
Po: Pophers	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
RaB: Rayburn	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, too clayey.	Moderate: wetness, depth to rock.	Poor: too clayey, hard to pack.
RaD: Rayburn	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: depth to rock, too clayey.	Moderate: depth to rock, wetness, slope.	Poor: too clayey, hard to pack.
RkB: Raylake	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
RnB: Rentzel	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage.	Fair: wetness.
RoB: Rosenwall	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
RoD: Rosenwall	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SaB----------------- Sacul	Severe: percs slowly, wetness.	Severe: wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
SaD----------------- Sacul	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: too clayey.	Moderate: slope, wetness.	Poor: too clayey, hard to pack.
SbB: Sacul---------------	Severe: percs slowly, wetness.	Severe: wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Urban land.					
StD----------------- Stringtown	Moderate: slope.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: too clayey, slope, small stones.
StF----------------- Stringtown	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
TeD----------------- Tehran	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: too sandy, slope.
TnD----------------- Tenaha	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Severe: seepage.	Fair: too sandy, slope.
WoB----------------- Woodtell	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
WoD----------------- Woodtell	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
AaB: Alazan	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ab:				
Alazan	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Besner	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
AcB:				
Alazan	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
AtB: Attoyac	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
AtD: Attoyac	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
BaB: Bernaldo	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Bb:				
Bernaldo	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Besner	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
BnB: Bienville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
BrC, BrD: Browndell	Poor: depth to rock, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey.
CoB: Corrigan	Poor: depth to rock, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
CtD: Cuthbert	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
CtF: Cuthbert	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
CuD------------------- Cuthbert	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
DaC------------------- Darco	Good------------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
DaD------------------- Darco	Good------------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, slope.
DbA, DbB-------------- Diboll	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess sodium.
Du. Dumps				
EtB------------------- Etoile	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
FfA, FfB-------------- Fuller	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess sodium.
FuB:				
Fuller----------------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess sodium.
Urban land.				
HeA, HeB-------------- Herty	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey.
HuB:				
Herty-----------------	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey.
Urban land.				
Iu-------------------- Iuka	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
KaB------------------- Keithville	Fair: low strength, thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Kb:				
Keithville------------	Fair: low strength, thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
Kb:				
Sawtown	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
KcB Keltys	Fair: area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
KcD Keltys	Fair: area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
KdB:				
Keltys	Fair: area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
KdD:				
Keltys	Fair: area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Urban land.				
KfB, KgB Kirvin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
KhB Kirvin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
KmD Kisatchie	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ko, Kp Koury	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ks:				
Koury	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
KuB Kurth	Fair: depth to rock, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
KwB:				
Kurth	Fair: depth to rock, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
LaB------------------- Lacerda	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
LeC------------------- Letney	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
LtB------------------- Lilbert	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Ma-------------------- Mantachie	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Me, Mf---------------- Marietta	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
MhB------------------- Melhomes	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: wetness.
MoA------------------- Mollville	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Mp:				
Mollville------------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Besner---------------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
MsB, MsD-------------- Moswell	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
MuB:				
Moswell--------------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land.				
Mx:				
Moten----------------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Multey---------------	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
NaD------------------- Naclina	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Oz-------------------- Ozias	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Pa. Pits				

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
Po------------------- Pophers	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
RaB, RaD------------- Rayburn	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
RkB------------------ Raylake	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
RnB------------------ Rentzel	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
RoB, RoD------------- Rosenwall	Poor: depth to rock, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
SaB, SaD------------- Sacul	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
SbB:				
Sacul----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Urban land.				
StD------------------ Stringtown	Fair: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
StF------------------ Stringtown	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
TeD------------------ Tehran	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, slope.
TnD------------------ Tenaha	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, slope.
WoB, WoD------------- Woodtell	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
AaB: Alazan	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Favorable	Wetness	Favorable.
Ab:						
Alazan	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Favorable	Wetness	Favorable.
Besner	Severe: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Favorable	Favorable.
AcB:						
Alazan	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Favorable	Wetness	Favorable.
Urban land.						
AtB: Attoyac	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Favorable	Favorable.
AtD: Attoyac	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope.
BaB: Bernaldo	Moderate: seepage.	Moderate: piping.	Moderate: deep to water, slow refill.	Deep to water	Favorable	Favorable.
Bb:						
Bernaldo	Moderate: seepage.	Moderate: piping.	Moderate: deep to water, slow refill.	Deep to water	Favorable	Favorable.
Besner	Severe: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Favorable	Favorable.
BnB: Bienville	Severe: seepage.	Severe: piping.	Severe: cutbanks cave.	Deep to water	Favorable	Droughty.
BrC: Browndell	Severe: depth to rock.	Severe: hard to pack, thin layer.	Severe: no water.	Deep to water	Depth to rock, erodes easily.	Erodes easily, depth to rock.
BrD: Browndell	Severe: depth to rock.	Severe: hard to pack, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
CoB: Corrigan	Moderate: depth to rock.	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly, depth to rock, slope.	Depth to rock, erodes easily, wetness.	Wetness, erodes easily, depth to rock, percs slowly.
CtD, CtF: Cuthbert	Slight	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, droughty.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
CuD: Cuthbert	Slight	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, droughty.
DaC: Darco	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
DaD: Darco	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, slope, soil blowing.	Droughty, slope.
DbA, DbB: Diboll	Moderate: depth to rock.	Severe: piping, wetness, excess sodium.	Severe: no water.	Percs slowly, excess sodium.	Wetness, erodes easily, percs slowly.	Wetness, excess sodium, erodes easily.
Du. Dumps						
EtB: Etoile	Slight	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness.	Wetness, erodes easily.
FfA, FfB: Fuller	Moderate: depth to rock, seepage.	Severe: piping, wetness, excess sodium.	Severe: no water.	Percs slowly, excess sodium.	Erodes easily, wetness.	Wetness, excess sodium, erodes easily.
FuB: Fuller	Moderate: depth to rock, seepage.	Severe: piping, wetness, excess sodium.	Severe: no water.	Percs slowly, excess sodium.	Erodes easily, wetness, percs slowly.	Wetness, excess sodium, erodes easily.
Urban land.						
HeA: Herty	Slight	Severe: wetness.	Severe: no water.	Percs slowly	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
HeB: Herty	Slight	Severe: wetness.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
HuB: Herty	Slight	Severe: wetness.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
Urban land.						
Iu: Iuka	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding	Wetness	Wetness.
KaB: Keithville	Slight	Moderate: piping, wetness.	Severe: no water.	Percs slowly	Erodes easily, wetness.	Erodes easily, percs slowly.
Kb: Keithville		Moderate: piping, wetness.	Severe: no water.		Erodes easily, wetness.	Erodes easily, percs slowly.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Kb:						
Sawtown	Severe: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Soil blowing, erodes easily.	Erodes easily.
KcB Keltys	Moderate: depth to rock.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness, percs slowly.	Percs slowly, erodes easily.
KcD Keltys	Moderate: depth to rock.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
KdB:						
Keltys	Moderate: depth to rock.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness, percs slowly.	Percs slowly, erodes easily.
Urban land.						
KdD:						
Keltys	Moderate: depth to rock.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
Urban land.						
KfB Kirvin	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
KgB, KhB Kirvin	Slight	Severe: hard to pack.	Severe: no water.	Deep to water	Favorable	Favorable.
KmD Kisatchie	Moderate: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Ko, Kp Koury	Slight	Severe: piping, wetness.	Severe: slow refill.	Flooding	Erodes easily, wetness.	Erodes easily.
Ks:						
Koury	Slight	Severe: piping, wetness.	Severe: slow refill.	Flooding	Erodes easily, wetness.	Erodes easily.
Urban land.						
KuB Kurth	Moderate: depth to rock, seepage.	Moderate: piping, wetness.	Severe: no water.	Percs slowly	Erodes easily, wetness.	Erodes easily, percs slowly.
KwB:						
Kurth	Moderate: depth to rock, seepage.	Moderate: piping, wetness.	Severe: no water.	Percs slowly	Erodes easily, wetness.	Erodes easily, percs slowly.
Urban land.						
LaB Lacerda	Slight	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly	Percs slowly, wetness.	Wetness, percs slowly.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
LeC---------------- Letney	Severe: seepage.	Slight----------	Severe: no water.	Deep to water	Favorable-------	Droughty.
LtB---------------- Lilbert	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Soil blowing---	Droughty.
Ma----------------- Mantachie	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding--------	Wetness---------	Wetness.
Me, Mf------------- Marietta	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding--------	Wetness---------	Favorable.
MhB---------------- Melhomes	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, too sandy.	Wetness, droughty.
MoA---------------- Mollville	Moderate: seepage.	Severe: ponding.	Severe: no water.	Percs slowly, ponding.	Erodes easily, ponding, percs slowly.	Erodes easily, wetness, percs slowly.
Mp: Mollville---------	Moderate: seepage.	Severe: ponding.	Severe: no water.	Percs slowly, ponding.	Erodes easily, ponding, percs slowly.	Erodes easily, wetness, percs slowly.
Besner------------	Severe: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Favorable-------	Favorable.
MsB---------------- Moswell	Slight----------	Severe: hard to pack.	Severe: slow refill.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
MsD---------------- Moswell	Slight----------	Severe: hard to pack.	Severe: slow refill.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
MuB: Moswell-----------	Slight----------	Severe: hard to pack.	Severe: slow refill.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Urban land.						
Mx: Moten-------------	Moderate: seepage.	Severe: piping, wetness.	Severe: no water.	Favorable-------	Erodes easily, wetness, percs slowly.	Erodes easily, wetness.
Multey------------	Moderate: seepage.	Severe: piping.	Severe: no water.	Favorable-------	Erodes easily, wetness, soil blowing.	Erodes easily.
NaD---------------- Naclina	Slight----------	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness, percs slowly.	Wetness, slope, percs slowly.
Oz----------------- Ozias	Slight----------	Severe: wetness.	Severe: slow refill.	Percs slowly, flooding, excess salt.	Wetness, percs slowly.	Excess salt, percs slowly, wetness.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Pa. Pits						
Po----------------- Pophers	Slight---------	Severe: wetness.	Severe: slow refill.	Flooding, excess salt.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
RaB---------------- Rayburn	Moderate: depth to rock.	Severe: hard to pack.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, percs slowly.
RaD---------------- Rayburn	Moderate: depth to rock.	Severe: hard to pack.	Severe: no water.	Percs slowly, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
RkB---------------- Raylake	Slight---------	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly---	Wetness, percs slowly.	Wetness, percs slowly.
RnB---------------- Rentzel	Severe: seepage.	Severe: piping.	Severe: no water.	Favorable------	Wetness--------	Favorable.
RoB---------------- Rosenwall	Moderate: depth to rock.	Severe: hard to pack.	Severe: no water.	Deep to water	Depth to rock, erodes easily.	Erodes easily, depth to rock.
RoD---------------- Rosenwall	Moderate: depth to rock.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
SaB---------------- Sacul	Slight---------	Severe: hard to pack.	Moderate: deep to water.	Deep to water	Percs slowly, wetness.	Percs slowly.
SaD---------------- Sacul	Slight---------	Severe: hard to pack.	Moderate: deep to water.	Deep to water	Slope, percs slowly, wetness.	Slope, percs slowly.
SbB:						
Sacul-------------	Slight---------	Severe: hard to pack.	Moderate: deep to water.	Deep to water	Percs slowly, wetness.	Percs slowly.
Urban land.						
StD, StF---------- Stringtown	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope----------	Slope.
TeD---------------- Tehran	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, droughty.
TnD---------------- Tenaha	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Droughty, slope.
WoB---------------- Woodtell	Slight---------	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily	Erodes easily, percs slowly.
WoD---------------- Woodtell	Slight---------	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, percs slowly.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated. Some soils may have Unified classifications and USDA textures in addition to those shown. In general, the dominant classifications and textures are shown]

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AaB: Alazan	0-16	Very fine sandy loam.	ML, CL-ML	A-4	0	100	96-100	90-100	51-80	<25	NP-7
	16-72	Loam, sandy clay loam.	CL	A-6, A-4	0	100	96-100	90-100	51-85	25-40	8-22
Ab:											
Alazan	0-19	Very fine sandy loam.	ML, CL-ML	A-4	0	100	96-100	90-100	51-80	<25	NP-7
	19-60	Loam, sandy clay loam.	CL	A-6, A-4	0	100	96-100	90-100	51-85	25-40	8-22
Besner	0-31	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	100	95-100	90-100	45-70	<25	NP-7
	31-60	Loam, fine sandy loam.	CL-ML, ML, SM-SC, SM	A-4	0	100	95-100	80-100	40-75	<25	NP-7
AcB:											
Alazan	0-10	Very fine sandy loam.	ML, CL-ML	A-4	0	100	96-100	90-100	51-80	<25	NP-7
	10-67	Loam, sandy clay loam.	CL	A-6, A-4	0	100	96-100	90-100	51-85	25-40	8-22
Urban land.											
AtB: Attoyac	0-11	Fine sandy loam	SM-SC, CL-ML, ML, SM	A-4	0	98-100	95-100	70-100	40-65	<23	NP-7
	11-72	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-4, A-6	0	98-100	95-100	80-100	45-75	23-40	7-22
AtD: Attoyac	0-6	Fine sandy loam	SM-SC, CL-ML, ML, SM	A-4	0	98-100	95-100	70-100	40-65	<23	NP-7
	6-65	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-4, A-6	0	98-100	95-100	80-100	45-75	23-40	7-22
BaB: Bernaldo	0-17	Fine sandy loam	SM, ML	A-4	0	100	95-100	90-100	40-60	<25	NP-4
	17-65	Loam, sandy clay loam.	CL	A-6	0	100	100	90-100	51-75	26-40	12-24
Bb:											
Bernaldo	0-11	Fine sandy loam	SM, ML	A-4	0	100	95-100	90-100	40-60	<25	NP-4
	11-65	Loam, sandy clay loam.	CL	A-6	0	100	100	90-100	51-75	26-40	12-24
Besner	0-26	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	100	95-100	90-100	45-70	<25	NP-7
	26-80	Loam, fine sandy loam.	CL-ML, ML, SM-SC, SM	A-4	0	100	95-100	80-100	40-75	<25	NP-7

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BnB-------------- Bienville	0-20	Loamy fine sand	SM	A-2-4, A-4	0	100	100	90-100	15-50	<25	NP-3
	20-80	Loamy fine sand, fine sandy loam.	SM, ML	A-2-4, A-4	0	100	100	90-100	30-55	<25	NP-3
BrC-------------- Browndell	0-9	Fine sandy loam	SM-SC, SC, CL, CL-ML	A-4, A-6	0-15	90-100	85-100	70-85	40-55	21-30	4-11
	9-16	Clay, silty clay	CH	A-7	0	85-100	85-100	80-100	75-95	52-76	30-50
	16-30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
BrD-------------- Browndell	0-4	Fine sandy loam	SM-SC, SC, CL, CL-ML	A-4, A-6	0-15	90-100	85-100	70-85	40-55	21-30	4-11
	4-16	Clay, silty clay	CH	A-7	0	85-100	85-100	80-100	75-95	52-76	30-50
	16-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CoB-------------- Corrigan	0-6	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4	0	100	100	70-100	36-55	21-30	2-7
	6-39	Clay, silty clay	CH	A-7	0	100	100	90-100	65-95	52-76	30-50
	39-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CtD-------------- Cuthbert	0-9	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0-1	85-100	78-100	75-98	20-55	<30	NP-6
	9-37	Sandy clay, clay	SC, CL, CH	A-6, A-7	0-1	95-100	90-100	80-100	45-98	37-63	19-40
	37-60	Sandy clay loam, shaly clay.	SC, CL	A-6, A-7, A-2-6, A-2-7	0-1	89-100	85-100	80-100	28-84	29-45	11-26
CtF-------------- Cuthbert	0-6	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0-1	85-100	78-100	75-98	20-55	<30	NP-6
	6-28	Clay loam, sandy clay, clay.	SC, CL, CH	A-6, A-7	0-1	95-100	90-100	80-100	45-98	37-63	19-40
	28-60	Sandy clay loam, shaly clay.	SC, CL	A-6, A-7, A-2-6, A-2-7	0-1	89-100	85-100	80-100	28-84	29-45	11-26
CuD-------------- Cuthbert	0-7	Gravelly fine sandy loam.	SM, GM	A-1-B, A-2-4, A-4	0-5	55-78	50-78	35-73	20-49	<25	NP-4
	7-27	Clay loam, sandy clay, clay.	SC, CL, CH	A-6, A-7	0-1	95-100	90-100	80-100	45-98	37-63	19-40
	27-60	Sandy clay loam, shaly clay.	SC, CL	A-6, A-7, A-2-6, A-2-7	0-1	89-100	85-100	80-100	28-84	29-45	11-26
DaC-------------- Darco	0-55	Loamy fine sand	SM	A-2-4	0-2	95-100	95-100	60-90	15-30	<20	NP-3
	55-80	Sandy clay loam, sandy loam.	SC	A-6, A-4	0	100	95-100	80-95	30-50	25-35	8-15
DaD-------------- Darco	0-57	Loamy fine sand	SM	A-2-4	0-2	95-100	95-100	60-90	15-30	<20	NP-3
	57-80	Sandy clay loam, sandy loam.	SC	A-6, A-4	0	100	95-100	80-95	30-50	25-35	8-15

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
DbA-------------- Diboll	0-27	Very fine sandy loam.	ML, CL-ML, CL	A-4	0	98-100	98-100	90-100	70-90	20-30	3-9
	27-42	Loam, silty clay loam, clay loam.	CL, CH	A-4, A-6, A-7	0	98-100	98-100	90-100	70-90	25-52	9-35
	42-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
DbB-------------- Diboll	0-29	Very fine sandy loam.	ML, CL-ML, CL	A-4	0	98-100	98-100	90-100	70-90	20-30	3-9
	29-36	Loam, silty clay loam, clay loam.	CL	A-4, A-6	0	98-100	98-100	90-100	70-90	25-40	9-20
	36-43	Clay loam, silty clay loam, loam.	CL, CH	A-6, A-7	0	98-100	98-100	90-100	70-87	32-60	12-36
	43-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Du. Dumps											
EtB-------------- Etoile	0-5	Loam-------------	CL-ML, ML	A-4	0	98-100	98-100	85-95	51-85	<30	NP-7
	5-17	Clay-------------	CH	A-7-6	0	98-100	98-100	80-100	75-98	51-76	35-50
	17-60	Clay-------------	CH	A-7-6	0	98-100	98-100	80-100	75-98	51-76	35-50
FfA-------------- Fuller	0-28	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4	0	98-100	98-100	95-100	40-60	<25	NP-7
	28-35	Silty clay loam, clay loam, weathered bedrock.	CL, CH	A-7-6	0	98-100	98-100	95-100	51-75	45-60	28-40
	35-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
FfB-------------- Fuller	0-39	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4	0	98-100	98-100	95-100	40-60	<25	NP-7
	39-58	Silty clay loam, clay loam, weathered bedrock.	CL, CH	A-7-6	0	98-100	98-100	95-100	51-75	45-60	28-40
	58-70	Weathered bedrock	---	---	---	---	---	---	---	---	---
FuB: Fuller----------	0-23	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4	0	98-100	98-100	95-100	40-60	<25	NP-7
	23-42	Silty clay loam, clay loam, weathered bedrock.	CL, CH	A-7-6	0	98-100	98-100	95-100	51-75	45-60	28-40
	42-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
HeA-------------- Herty	0-6	Very fine sandy loam.	CL, CL-ML	A-4, A-6	0	98-100	98-100	95-100	51-90	18-35	4-15
	6-53	Clay, silty clay	CH, CL	A-7-6, A-6	0	98-100	98-100	95-100	75-95	36-53	20-35
	53-65	Clayey shale, clay.	CH	A-7-6	0	98-100	98-100	95-100	65-95	51-75	30-50

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HeB-------------- Herty	0-3	Very fine sandy loam.	CL, CL-ML	A-4, A-6	0	98-100	98-100	95-100	51-90	18-35	4-15
	3-21	Clay loam, clay, silty clay loam.	CL, CH	A-6, A-7-6	0	98-100	98-100	95-100	75-95	36-53	20-35
	21-44	Clay, silty clay	CH	A-7-6	0	98-100	98-100	95-100	75-95	51-75	30-50
	44-70	Clayey shale, clay.	CH	A-7-6	0	98-100	98-100	95-100	65-95	51-75	30-50
HuB:											
Herty-----------	0-4	Very fine sandy loam.	CL, CL-ML	A-4, A-6	0	98-100	98-100	95-100	51-90	18-35	4-15
	4-28	Clay loam, clay, silty clay loam.	CL, CH	A-6, A-7-6	0	98-100	98-100	95-100	75-95	36-53	20-35
	28-43	Clay, silty clay	CH	A-7-6	0	98-100	98-100	95-100	75-95	51-75	30-50
	43-60	Clayey shale, clay.	CH	A-7-6	0	98-100	98-100	95-100	65-95	51-75	30-50
Urban land.											
Iu--------------- Iuka	0-18	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2	0	95-100	90-100	70-100	30-60	<20	NP-7
	18-60	Fine sandy loam, loam, sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	95-100	85-100	65-100	36-75	<30	NP-7
KaB-------------- Keithville	0-16	Very fine sandy loam.	ML, CL-ML	A-4	0	100	100	85-100	50-90	<25	NP-6
	16-27	Silt loam, clay loam, loam, silty clay loam.	CL	A-6, A-4	0	100	100	90-100	65-95	25-35	8-16
	27-65	Silty clay, clay, clay loam.	CH, CL	A-7-6	0	100	100	95-100	65-95	41-66	22-38
Kb:											
Keithville------	0-10	Silt loam--------	ML, CL-ML	A-4	0	100	100	85-100	50-90	<25	NP-6
	10-34	Silt loam, clay loam, loam, silty clay loam.	CL	A-6, A-4	0	100	100	90-100	65-95	25-35	8-16
	34-65	Silty clay, clay, clay loam.	CH, CL	A-7-6	0	100	100	95-100	65-95	41-66	22-38
	65-80	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sawtown---------	0-17	Fine sandy loam	ML	A-4	0	95-100	95-100	80-98	51-75	<25	NP-4
	17-35	Loam, silt loam, silty clay loam.	CL	A-6	0	95-100	95-100	90-98	51-80	28-40	12-22
	35-65	Clay loam, silty clay loam, clay, silty clay.	CL, CH	A-6, A-7	0	95-100	95-100	90-98	60-85	36-60	20-38
KcB-------------- Keltys	0-26	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	98-100	98-100	85-100	36-60	<30	NP-7
	26-48	Fine sandy loam	SC, SM-SC, CL, CL-ML	A-4	0	98-100	98-100	85-100	36-55	20-30	4-10
	48-80	Weathered bedrock	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
KcD------------- Keltys	0-18	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	98-100	98-100	85-100	36-60	<30	NP-7
	18-44	Fine sandy loam	SC, SM-SC, CL, CL-ML	A-4	0	98-100	98-100	85-100	36-55	20-30	4-10
	44-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
KdB:											
Keltys----------	0-18	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	98-100	98-100	85-100	36-60	<30	NP-7
	18-46	Fine sandy loam	SC, SM-SC, CL, CL-ML	A-4	0	98-100	98-100	85-100	36-55	20-30	4-10
	46-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
KdD:											
Keltys----------	0-17	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	98-100	98-100	85-100	36-60	<30	NP-7
	17-46	Fine sandy loam	SC, SM-SC, CL, CL-ML	A-4	0	98-100	98-100	85-100	36-55	20-30	4-10
	46-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
KfB------------- Kirvin	0-11	Fine sandy loam	SM, ML, CL, SC	A-4	0-2	85-100	78-98	70-95	36-70	<30	NP-8
	11-35	Clay loam, sandy clay, clay.	CL, CH	A-7	0-1	95-100	95-100	85-100	75-95	45-67	25-43
	35-46	Sandy clay loam, clay loam.	CL	A-6, A-7	0-1	95-100	90-100	75-100	51-90	32-50	16-30
	46-65	Stratified sandy loam to very shaly clay.	SC, CL, CH	A-4, A-6, A-7	0-1	95-100	90-100	50-90	36-80	25-52	9-32
KgB------------- Kirvin	0-14	Gravelly fine sandy loam.	SM, GM, SC, GM-GC	A-2-4, A-4	0-5	55-78	47-78	35-70	25-49	<30	NP-8
	14-45	Clay loam, sandy clay, clay.	CL, CH	A-7	0-1	95-100	95-100	85-100	75-95	45-67	25-43
	45-50	Sandy clay loam, clay loam.	CL	A-6, A-7	0-1	95-100	90-100	75-100	51-90	32-50	16-30
	50-65	Stratified sandy loam to very shaly clay.	SC, CL, CH	A-4, A-6, A-7	0-1	95-100	90-100	50-90	36-80	25-52	9-32
KhB------------- Kirvin	0-3	Gravelly clay loam.	CL	A-6, A-7	0-5	75-90	70-90	55-85	51-80	32-50	16-30
	3-47	Clay, sandy clay, clay loam.	CL, CH	A-7	0-2	95-100	95-100	85-99	75-95	45-67	25-43
	47-60	Stratified sandy loam to very shaly clay.	SC, CL, CH	A-4, A-6, A-7	0-1	95-100	90-100	50-90	36-80	25-52	9-32

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
KmD--------------	0-6	Fine sandy loam	SM, ML	A-4	0	100	100	70-85	40-55	<25	NP-4
Kisatchie	6-36	Silty clay, clay	CH, CL	A-7-6	0	100	100	90-100	85-95	45-65	22-36
	36-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ko---------------	0-17	Loam, very fine sandy loam.	CL-ML, ML, CL	A-4	0	98-100	98-100	95-100	55-95	20-31	3-10
Koury	17-50	Loam, silt loam, very fine sandy loam.	CL-ML, ML, CL	A-4, A-6	0	98-100	98-100	95-100	65-95	20-40	4-20
	50-70	Silt loam--------	CL-ML, CL	A-4, A-6	0	98-100	98-100	95-100	65-95	20-40	4-20
Kp---------------	0-24	Loam-------------	CL-ML, ML, CL	A-4	0	98-100	98-100	95-100	55-95	20-31	3-10
Koury	24-45	Loam, silt loam, very fine sandy loam.	CL-ML, ML, CL	A-4, A-6	0	98-100	98-100	95-100	65-95	20-40	4-20
	45-74	Silt loam--------	CL-ML, CL	A-4, A-6	0	98-100	98-100	95-100	65-95	20-40	4-20
Ks:											
Koury-----------	0-14	Loam-------------	CL-ML, ML, CL	A-4	0	98-100	98-100	95-100	55-95	20-31	3-10
	14-48	Loam, silt loam, very fine sandy loam.	CL-ML, ML, CL	A-4, A-6	0	98-100	98-100	95-100	65-95	20-40	4-20
	48-62	Silt loam--------	CL-ML, CL	A-4, A-6	0	98-100	98-100	95-100	65-95	20-40	4-20
Urban land.											
KuB--------------	0-27	Fine sandy loam	SM, SM-SC	A-2-4, A-4	0	98-100	98-100	85-100	25-50	<30	NP-7
Kurth	27-33	Fine sandy loam, loam, sandy clay loam.	SC, SM-SC, CL, CL-ML	A-4	0	98-100	96-100	85-100	40-80	20-30	4-10
	33-56	Sandy clay loam, clay loam.	CL	A-6	0	98-100	96-100	85-100	51-80	25-40	11-20
	56-65	Weathered bedrock	---	---	---	---	---	---	---	---	---
KwB:											
Kurth-----------	0-28	Fine sandy loam	SM, SM-SC	A-2-4, A-4	0	98-100	98-100	85-100	25-50	<30	NP-7
	28-54	Sandy clay loam, clay loam.	CL	A-6	0	98-100	96-100	85-100	51-80	25-40	11-20
	54-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
LaB--------------	0-2	Clay loam--------	CL	A-6, A-7	0	98-100	96-100	95-100	80-98	30-50	15-30
Lacerda	2-42	Silty clay, clay	CH	A-7	0	98-100	96-100	95-100	85-98	51-70	30-45
	42-60	Clay, shale.	CH	A-7	0	100	100	95-100	80-98	51-70	30-45
LeC--------------	0-35	Loamy sand-------	SM, SP-SM	A-2	0	95-100	95-100	50-75	10-30	<20	NP
Letney	35-80	Sandy clay loam, sandy loam.	SC, SM-SC	A-6, A-4	0	95-100	95-100	65-90	36-50	20-40	5-20

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
LtB-------------- Lilbert	0-31	Loamy fine sand	SM	A-2-4, A-4	0	95-100	95-100	80-98	17-40	<20	NP-3
	31-65	Sandy clay loam	SC, CL	A-6, A-4	0	95-100	95-100	85-100	36-55	25-39	8-22
Ma--------------- Mantachie	0-5	Clay loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-80	20-40	5-15
	5-40	Loam, clay loam, sandy clay loam.	CL, SC, SM-SC, CL-ML	A-4, A-6	0-5	95-100	90-100	80-95	45-80	20-40	5-15
	40-60	Clay-------------	CL, CH	A-7	0	95-100	95-100	85-100	75-95	41-55	20-31
Me--------------- Marietta	0-9	Fine sandy loam	CL, CL-ML, SM-SC, SC	A-4	0	100	100	80-95	40-75	20-30	5-10
	9-60	Clay loam, sandy clay loam, loam.	CL, SC	A-6, A-4	0	100	100	85-100	45-90	25-40	8-20
Mf--------------- Marietta	0-10	Fine sandy loam	CL, CL-ML, SM-SC, SC	A-4	0	100	100	80-95	40-75	20-30	5-10
	10-60	Clay loam, sandy clay loam, loam.	CL, SC	A-6, A-4	0	100	100	85-100	45-90	25-40	8-20
MhB-------------- Melhomes	0-9	Loamy sand-------	SP-SM	A-2-4, A-3	0	100	98-100	60-85	5-12	---	NP
	9-65	Loamy sand, sand	SP-SM, SP, SM	A-2-4, A-3	0	100	90-100	51-80	3-15	---	NP
MoA-------------- Mollville	0-12	Loam-------------	ML, CL-ML, CL	A-4, A-6	0	100	100	85-100	50-80	25-40	3-15
	12-65	Clay loam, sandy clay loam.	CL	A-6	0	100	100	90-100	70-80	30-40	11-20
Mp:											
Mollville--------	0-10	Loam-------------	ML, CL-ML, CL	A-4, A-6	0	100	100	85-100	50-80	25-40	3-15
	10-65	Clay loam, sandy clay loam.	CL	A-6	0	100	100	90-100	70-80	30-40	11-20
Besner-----------	0-32	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	100	95-100	90-100	45-70	<25	NP-7
	32-60	Loam, fine sandy loam.	CL-ML, ML, SM-SC, SM	A-4	0	100	95-100	80-100	40-75	<25	NP-7
MsB-------------- Moswell	0-5	Loam-------------	ML, CL-ML	A-4	0	97-100	95-100	80-95	51-70	<30	NP-7
	5-23	Clay-------------	CH	A-7	0	97-100	95-100	90-100	85-99	65-95	35-65
	23-45	Clay-------------	CH	A-7	0	97-100	95-100	90-100	85-99	70-95	40-65
	45-70	Shaly clay, very shaly clay, clay.	CH	A-7	0	97-100	95-100	90-100	85-99	70-95	55-70
MsD-------------- Moswell	0-5	Loam-------------	ML, CL-ML	A-4	0	97-100	95-100	80-95	51-70	<30	NP-7
	5-50	Clay-------------	CH	A-7	0	97-100	95-100	90-100	85-99	65-95	35-65
	50-60	Shaly clay, very shaly clay, clay.	CH	A-7	0	97-100	95-100	90-100	85-99	70-95	55-70

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MuB:											
Moswell	0-7	Loam	ML, CL-ML	A-4	0	97-100	95-100	80-95	51-70	<30	NP-7
	7-48	Clay	CH	A-7	0	97-100	95-100	90-100	85-99	65-95	35-65
	48-60	Shaly clay, very shaly clay, clay.	CH	A-7	0	97-100	95-100	90-100	85-99	70-95	55-70
Urban land.											
Mx:											
Moten	0-26	Silt loam	CL-ML, ML	A-4	0	98-100	98-100	95-100	60-85	<30	NP-7
	26-52	Loam, silt loam	CL-ML, CL	A-4, A-6	0	98-100	98-100	90-100	51-80	18-30	4-12
	52-65	Sandy clay loam, loam, clay loam, silty clay loam, silt loam.	CL-ML, CL	A-4, A-6, A-7	0	98-100	98-100	85-100	51-85	20-45	5-20
Multey	0-25	Fine sandy loam	ML, CL-ML, SM-SC, SM	A-4	0	98-100	98-100	90-100	40-60	<30	NP-7
	25-38	Fine sandy loam, very fine sandy loam, loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0	98-100	98-100	90-100	45-65	22-34	5-15
	38-65	Loam, sandy clay loam, very fine sandy loam.	CL	A-4, A-6	0	98-100	98-100	90-100	51-70	25-40	8-20
	65-70	Stratified fine sandy loam to clay loam.	ML, CL, SM, SC	A-4, A-6, A-2-4, A-2-6	0	98-100	95-100	60-100	30-80	20-40	3-18
NaD Naclina	0-3	Clay	CH	A-7-6	0	98-100	96-100	95-100	85-98	51-70	26-40
	3-45	Clay, silty clay	CH	A-7-6	0	98-100	96-100	95-100	85-98	58-76	35-50
	45-60	Clay	CH	A-7-6	0	98-100	96-100	95-100	80-98	58-76	35-50
Oz Ozias	0-10	Silty clay	CL, CH	A-7	0	99-100	98-100	97-100	85-100	45-70	20-40
	10-44	Clay, silty clay, silty clay loam.	CH, CL	A-7	0	99-100	98-100	97-100	85-100	45-70	20-40
	44-80	Clay, silty clay, silty clay loam.	CH	A-7	0	99-100	98-100	97-100	85-100	51-70	25-40
Pa. Pits											
Po Pophers	0-10	Silty clay loam	CL	A-6, A-7	0	98-100	98-100	96-100	80-98	25-45	11-20
	10-46	Silty clay loam, silt loam, loam.	CL	A-6, A-7	0	98-100	98-100	96-100	80-98	25-45	12-30
	46-80	Silty clay loam, clay loam, loam, silty clay.	CL	A-6, A-7	0	98-100	98-100	96-100	80-98	25-45	12-30
RaB Rayburn	0-8	Fine sandy loam	CL-ML, ML, SM, SM-SC	A-4, A-2-4	0	100	100	70-99	25-65	<25	NP-7
	8-50	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	51-80	25-50
	50-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RaD Rayburn	0-6	Fine sandy loam	CL-ML, ML, SM, SM-SC	A-4, A-2-4	0	100	100	70-99	25-65	<25	NP-7
	6-47	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	51-80	25-50
	47-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RkB---------------- Raylake	0-4	Clay loam--------	CL	A-6, A-7	0	98-100	96-100	95-100	80-98	30-50	15-30
	4-11	Clay, silty clay	CH	A-7	0	98-100	96-100	95-100	90-100	51-70	30-45
	11-51	Clay-------------	CH	A-7	0	95-100	95-100	95-100	90-100	51-70	30-45
	51-65	Clay, shaly clay	CH	A-7	0	95-100	95-100	95-100	80-100	51-70	30-45
RnB---------------- Rentzel	0-24	Loamy fine sand	SM	A-2-4, A-4	0	97-100	95-100	75-98	15-40	<30	NP-4
	24-60	Sandy clay loam, fine sandy loam.	SC, CL, SM-SC, CL-ML	A-6, A-4, A-7	0	95-100	90-100	75-98	36-55	20-43	4-22
RoB---------------- Rosenwall	0-7	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	95-100	95-100	75-95	45-70	<30	NP-7
	7-27	Clay-------------	MH, CH	A-7	0	95-100	95-100	90-100	75-95	60-75	30-41
	27-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
RoD---------------- Rosenwall	0-6	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	95-100	95-100	75-95	45-70	<30	NP-7
	6-25	Clay-------------	MH, CH	A-7	0	95-100	95-100	90-100	75-95	60-75	30-41
	25-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
SaB---------------- Sacul	0-8	Fine sandy loam	SM, ML	A-4	0	95-100	90-100	80-100	40-65	<20	NP-3
	8-56	Clay, silty clay, clay loam.	CH, CL	A-7	0	95-100	90-100	85-95	80-90	45-70	20-40
	56-65	Silty clay loam, silt loam, clay loam.	CL, CH, SC	A-6, A-7, A-4	0	95-100	90-100	85-100	40-90	25-55	8-32
SaD---------------- Sacul	0-9	Fine sandy loam	SM, ML	A-4	0	95-100	90-100	80-100	40-65	<20	NP-3
	9-44	Clay, silty clay	CH, CL	A-7	0	95-100	90-100	85-95	80-90	45-70	20-40
	44-60	Silty clay loam, silt loam, clay loam.	CL, CH, SC	A-6, A-7, A-4	0	95-100	90-100	85-100	40-90	25-55	8-32
SbB:											
Sacul------------	0-9	Fine sandy loam	SM, ML	A-4	0	95-100	90-100	80-100	40-65	<20	NP-3
	9-54	Clay, silty clay	CH, CL	A-7	0	95-100	90-100	85-95	80-90	45-70	20-40
	54-60	Silty clay loam, silt loam, clay loam.	CL, CH, SC	A-6, A-7, A-4	0	95-100	90-100	85-100	40-90	25-55	8-32
Urban land.											
StD---------------- Stringtown	0-12	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0-1	90-100	85-100	70-85	36-55	<30	NP-7
	12-50	Sandy clay loam, clay loam.	SC, CL	A-4, A-6	0-1	80-100	70-100	65-100	36-65	20-40	8-20
	50-65	Variable----------	---	---	---	---	---	---	---	---	---
StF---------------- Stringtown	0-9	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0-1	90-100	85-100	70-85	36-55	<30	NP-7
	9-41	Sandy clay loam, clay loam.	SC, CL	A-4, A-6	0-1	80-100	70-100	65-100	36-65	20-40	8-20
	41-60	Variable----------	---	---	---	---	---	---	---	---	---
TeD---------------- Tehran	0-53	Loamy sand--------	SM	A-2-4	0	95-100	95-100	50-80	15-30	<20	NP-3
	53-70	Sandy clay loam, sandy loam.	SC, SM-SC	A-4, A-6, A-2-4, A-2-6	0	95-100	95-100	60-80	24-50	20-37	5-16

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
TnD----------------- Tenaha	0-25	Loamy fine sand	SM	A-2-4, A-4	0	95-100	95-100	70-95	15-40	<20	NP-3
	25-56	Sandy clay loam, clay loam.	SC, CL	A-6, A-4, A-7-6	0	95-100	95-100	80-100	36-66	25-46	8-26
	56-65	Stratified fine sandy loam to very shaly clay.	SC, CL	A-6, A-7, A-2-6, A-2-7	0-3	89-100	85-100	80-100	28-60	25-45	11-26
WoB----------------- Woodtell	0-4	Very fine sandy loam.	CL, SM-SC, CL-ML, ML	A-4, A-6	0-2	95-100	90-100	75-100	40-75	20-33	3-13
	4-41	Clay--------------	CH	A-7-6	0	100	90-100	80-100	60-98	40-75	25-46
	41-60	Shale-------------	CL, CH	A-6, A-7-6	0	100	80-100	75-100	51-98	35-65	15-45
WoD----------------- Woodtell	0-8	Very fine sandy loam.	CL, SM-SC, CL-ML, ML	A-4, A-6	0-2	95-100	90-100	75-100	40-75	20-33	3-13
	8-51	Clay--------------	CH	A-7-6	0	100	90-100	80-100	60-98	40-75	25-46
	51-65	Shale-------------	CL, CH	A-6, A-7-6	0	100	80-100	75-100	51-98	35-65	15-45

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	Mmhos/cm				Pct
AaB-------------- Alazan	0-16	5-15	1.40-1.65	2.0-6.0	0.11-0.15	4.5-6.0	<2	Low----------	0.32	5	.5-2
	16-72	18-25	1.45-1.70	0.6-2.0	0.15-0.20	4.5-7.3	<2	Low----------	0.28		
Ab:											
Alazan----------	0-19	5-15	1.40-1.65	2.0-6.0	0.11-0.15	4.5-6.0	<2	Low----------	0.32	5	.5-2
	19-60	18-25	1.45-1.70	0.6-2.0	0.15-0.20	4.5-7.3	<2	Low----------	0.28		
Besner----------	0-31	5-15	1.20-1.40	2.0-6.0	0.11-0.15	4.5-6.5	<2	Low----------	0.24	5	<1
	31-60	14-18	1.30-1.50	0.6-2.0	0.15-0.20	4.5-6.5	<2	Low----------	0.32		
AcB:											
Alazan----------	0-10	5-15	1.40-1.65	2.0-6.0	0.11-0.15	4.5-6.0	<2	Low----------	0.32	5	.5-2
	10-67	18-25	1.45-1.70	0.6-2.0	0.15-0.20	4.5-7.3	<2	Low----------	0.28		
Urban land.											
AtB-------------- Attoyac	0-11	8-20	1.30-1.50	2.0-6.0	0.11-0.15	5.1-6.5	<2	Low----------	0.32	5	<1
	11-72	18-32	1.40-1.65	0.6-2.0	0.12-0.17	5.1-6.5	<2	Low----------	0.32		
AtD-------------- Attoyac	0-6	8-20	1.30-1.50	2.0-6.0	0.11-0.15	5.1-6.5	<2	Low----------	0.32	5	<1
	6-65	18-32	1.40-1.65	0.6-2.0	0.12-0.17	5.1-6.5	<2	Low----------	0.32		
BaB-------------- Bernaldo	0-17	5-15	1.40-1.60	2.0-6.0	0.11-0.15	5.1-6.5	<2	Low----------	0.28	5	<1
	17-65	18-30	1.50-1.70	0.6-2.0	0.15-0.20	4.5-6.5	<2	Moderate----	0.32		
Bb:											
Bernaldo---------	0-11	5-15	1.40-1.60	2.0-6.0	0.11-0.15	5.1-6.5	<2	Low----------	0.28	5	<1
	11-65	18-30	1.50-1.70	0.6-2.0	0.15-0.20	4.5-6.5	<2	Moderate----	0.32		
Besner----------	0-26	5-15	1.20-1.40	2.0-6.0	0.11-0.15	4.5-6.5	<2	Low----------	0.24	5	<1
	26-80	14-18	1.30-1.50	0.6-2.0	0.15-0.20	4.5-6.5	<2	Low----------	0.32		
BnB-------------- Bienville	0-20	5-15	1.35-1.60	2.0-6.0	0.08-0.11	5.1-6.5	<2	Low----------	0.20	5	.5-2
	20-80	5-20	1.35-1.80	2.0-6.0	0.08-0.13	4.5-6.0	<2	Low----------	0.20		
BrC-------------- Browndell	0-9	8-20	1.20-1.40	0.6-2.0	0.11-0.15	4.5-6.5	<2	Low----------	0.43	2	<1
	9-16	40-60	1.30-1.50	<0.06	0.12-0.18	4.5-6.0	<2	High---------	0.32		
	16-30	---	---	---	---	---	---	-------------	----		
BrD-------------- Browndell	0-4	8-20	1.20-1.40	0.6-2.0	0.11-0.15	4.5-6.5	<2	Low----------	0.43	2	<1
	4-16	40-60	1.30-1.50	<0.06	0.12-0.18	4.5-6.0	<2	High---------	0.32		
	16-20	---	---	---	---	---	---	-------------	----		
CoB-------------- Corrigan	0-6	5-15	1.20-1.45	0.6-2.0	0.11-0.15	4.5-6.0	<2	Low----------	0.43	3	.5-3
	6-39	40-60	1.20-1.35	<0.06	0.12-0.18	3.6-5.5	<2	High---------	0.32		
	39-60	---	---	---	---	---	---	-------------	----		
CtD-------------- Cuthbert	0-9	2-15	1.20-1.40	2.0-6.0	0.11-0.15	4.5-6.5	<2	Low----------	0.37	3	<2
	9-37	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	<2	Moderate----	0.32		
	37-60	20-50	1.35-1.60	0.2-0.6	0.09-0.15	3.6-5.5	<2	Moderate----	0.32		
CtF-------------- Cuthbert	0-6	2-15	1.20-1.40	2.0-6.0	0.11-0.15	4.5-6.5	<2	Low----------	0.37	3	<2
	6-28	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	<2	Moderate----	0.32		
	28-60	20-50	1.35-1.60	0.2-0.6	0.09-0.15	3.6-5.5	<2	Moderate----	0.32		

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
									K	T	
	In	Pct	G/cc	In/hr	In/in	pH	Mmhos/cm				Pct
CuD-------------- Cuthbert	0-7	2-15	1.20-1.40	2.0-6.0	0.10-0.14	4.5-6.5	<2	Low---------	0.20	3	<2
	7-27	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	<2	Moderate----	0.32		
	27-60	20-50	1.35-1.60	0.2-0.6	0.09-0.15	3.6-5.5	<2	Moderate----	0.32		
DaC-------------- Darco	0-55	3-15	1.50-1.65	6.0-20	0.07-0.11	4.5-6.5	<2	Low---------	0.17	5	<1
	55-80	15-25	1.55-1.75	0.6-2.0	0.12-0.17	4.5-5.5	<2	Low---------	0.24		
DaD-------------- Darco	0-57	3-15	1.50-1.65	6.0-20	0.07-0.11	4.5-6.5	<2	Low---------	0.17	5	<1
	57-80	15-25	1.55-1.75	0.6-2.0	0.12-0.17	4.5-5.5	<2	Low---------	0.24		
DbA-------------- Diboll	0-27	3-10	1.50-1.70	0.2-0.6	0.10-0.20	4.5-6.5	<2	Low---------	0.55	3	<1
	27-42	18-40	1.35-1.50	<0.6	0.12-0.17	4.5-7.3	<4	Moderate----	0.37		
	42-60	---	---	---	---	---	---	------------	----		
DbB-------------- Diboll	0-29	3-10	1.50-1.70	0.2-0.6	0.10-0.20	4.5-6.5	<2	Low---------	0.55	3	<1
	29-36	18-35	1.35-1.50	0.2-0.6	0.12-0.17	4.5-7.3	<4	Moderate----	0.37		
	36-43	25-40	1.35-1.50	<0.06	0.12-0.17	5.1-7.3	<4	Moderate----	0.37		
	43-60	---	---	---	---	---	---	------------	----		
Du. Dumps											
EtB-------------- Etoile	0-5	10-25	1.35-1.55	0.6-2.0	0.13-0.20	5.1-7.3	<2	Low---------	0.43	5	.5-2
	5-17	40-60	1.35-1.50	<0.06	0.12-0.18	4.5-7.3	<2	High--------	0.32		
	17-60	40-60	1.35-1.60	<0.06	0.12-0.15	6.6-8.4	<2	High--------	0.32		
FfA-------------- Fuller	0-28	3-10	1.60-1.70	0.6-2.0	0.13-0.20	4.5-6.5	<2	Low---------	0.49	3	<1
	28-35	18-35	1.30-1.45	<0.06	0.12-0.17	6.6-8.4	<4	High--------	0.37		
	35-60	---	---	---	---	---	---	------------	----		
FfB-------------- Fuller	0-39	3-10	1.60-1.70	0.6-2.0	0.13-0.20	4.5-6.5	<2	Low---------	0.49	3	<1
	39-58	18-35	1.30-1.45	<0.06	0.12-0.17	6.6-8.4	<4	High--------	0.37		
	58-70	---	---	---	---	---	---	------------	----		
FuB: Fuller----------	0-23	3-10	1.60-1.70	0.6-2.0	0.13-0.20	4.5-6.5	<2	Low---------	0.49	3	<1
	23-42	18-35	1.30-1.45	<0.06	0.12-0.17	6.6-8.4	<4	High--------	0.37		
	42-60	---	---	---	---	---	---	------------	----		
Urban land.											
HeA-------------- Herty	0-6	6-15	1.20-1.40	0.6-2.0	0.11-0.20	4.5-6.0	<2	Low---------	0.49	5	<1
	6-53	40-70	1.20-1.50	<0.06	0.12-0.20	3.6-5.5	2-8	High--------	0.37		
	53-65	40-70	1.15-1.35	<0.06	0.12-0.20	3.6-5.0	4-8	High--------	0.37		
HeB-------------- Herty	0-3	6-15	1.20-1.40	0.6-2.0	0.11-0.20	4.5-6.0	<2	Low---------	0.49	5	<1
	3-21	35-45	1.40-1.60	0.06-0.2	0.12-0.18	3.6-5.5	<4	High--------	0.37		
	21-44	40-70	1.20-1.50	<0.06	0.12-0.20	3.6-5.0	2-8	High--------	0.37		
	44-70	40-70	1.15-1.35	<0.06	0.12-0.20	3.6-5.0	4-8	High--------	0.37		
HuB: Herty-----------	0-4	6-15	1.20-1.40	0.6-2.0	0.11-0.20	4.5-6.0	<2	Low---------	0.49	5	<1
	4-28	35-45	1.40-1.60	0.06-0.2	0.12-0.18	3.6-5.5	<4	High--------	0.37		
	28-43	40-70	1.20-1.50	<0.06	0.12-0.20	3.6-5.0	2-8	High--------	0.37		
	43-60	40-70	1.15-1.35	<0.06	0.12-0.20	3.6-5.0	4-8	High--------	0.37		
Urban land.											

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	Mmhos/cm				Pct
Iu--------------- Iuka	0-18	6-15	1.40-1.55	2.0-6.0	0.10-0.15	5.1-6.0	<2	Low----------	0.24	5	.5-2
	18-60	8-18	1.40-1.55	0.6-2.0	0.10-0.20	4.5-5.5	<2	Low----------	0.28		
KaB-------------- Keithville	0-16	8-22	1.35-1.65	0.2-2.0	0.15-0.20	5.1-6.0	<2	Low----------	0.43	5	.5-2
	16-27	18-35	1.35-1.70	0.2-0.6	0.15-0.20	3.6-6.0	<2	Low----------	0.37		
	27-65	35-60	1.20-1.60	0.06-0.2	0.15-0.18	3.6-6.0	<2	High---------	0.32		
Kb:											
Keithville-------	0-10	8-22	1.35-1.65	0.2-2.0	0.15-0.20	5.1-6.0	<2	Low----------	0.43	5	.5-2
	10-34	18-35	1.35-1.70	0.2-0.6	0.15-0.20	3.6-6.0	<2	Low----------	0.37		
	34-65	35-60	1.20-1.60	0.06-0.2	0.15-0.18	3.6-6.0	<2	High---------	0.32		
	65-80	---	---	---	---	---	---	-------------	----		
Sawtown----------	0-17	4-10	1.30-1.55	2.0-6.0	0.11-0.15	5.1-6.5	<2	Low----------	0.37	5	<1
	17-35	18-30	1.30-1.55	0.6-2.0	0.15-0.20	5.1-6.5	<2	Moderate-----	0.32		
	35-65	35-55	1.40-1.60	0.2-0.6	0.15-0.20	5.1-6.5	<2	High---------	0.32		
KcB-------------- Keltys	0-26	4-8	1.40-1.60	0.6-2.0	0.10-0.18	5.1-6.5	<2	Low----------	0.43	4	<1
	26-48	8-18	1.50-1.65	0.06-0.2	0.11-0.18	4.5-5.5	<2	Low----------	0.37		
	48-80	---	---	---	---	---	---	-------------	----		
KcD-------------- Keltys	0-10	4-8	1.40-1.60	0.6-2.0	0.10-0.18	5.1-6.5	<2	Low----------	0.43	4	<1
	10-18	4-8	1.40-1.60	0.6-2.0	0.10-0.18	5.1-6.0	<2	Low----------	0.43		
	18-44	8-18	1.50-1.65	0.06-0.2	0.11-0.18	4.5-5.5	<2	Low----------	0.37		
	44-60	---	---	---	---	---	---	-------------	----		
KdB:											
Keltys-----------	0-18	4-8	1.40-1.60	0.6-2.0	0.10-0.18	5.1-6.5	<2	Low----------	0.43	4	<1
	18-46	8-18	1.50-1.65	0.06-0.2	0.11-0.18	4.5-5.5	<2	Low----------	0.37		
	46-60	---	---	---	---	---	---	-------------	----		
Urban land.											
KdD:											
Keltys-----------	0-17	4-8	1.40-1.60	0.6-2.0	0.10-0.18	5.1-6.5	<2	Low----------	0.43	4	<1
	17-46	8-18	1.50-1.65	0.06-0.2	0.11-0.18	4.5-5.5	<2	Low----------	0.37		
	46-60	---	---	---	---	---	---	-------------	----		
Urban land.											
KfB-------------- Kirvin	0-11	2-15	1.20-1.40	2.0-6.0	0.11-0.16	5.1-7.3	<2	Low----------	0.37	4	<2
	11-35	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	<2	Moderate-----	0.32		
	35-46	25-40	1.35-1.60	0.2-0.6	0.10-0.16	3.6-5.0	<2	Moderate-----	0.32		
	46-65	18-40	1.40-1.65	0.06-0.2	0.08-0.16	3.6-5.0	<2	Moderate-----	0.32		
KgB-------------- Kirvin	0-14	2-15	1.20-1.40	2.0-6.0	0.08-0.12	5.1-7.3	<2	Low----------	0.20	4	<2
	14-45	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	<2	Moderate-----	0.32		
	45-50	25-40	1.35-1.60	0.2-0.6	0.10-0.16	3.6-5.0	<2	Moderate-----	0.32		
	50-65	18-40	1.40-1.65	0.06-0.2	0.08-0.16	3.6-5.0	<2	Moderate-----	0.32		
KhB-------------- Kirvin	0-3	27-40	1.20-1.40	0.2-0.6	0.12-0.17	5.1-7.3	<2	Moderate-----	0.32	4	<1
	3-47	35-60	1.30-1.45	0.2-0.6	0.12-0.18	3.6-5.5	<2	Moderate-----	0.32		
	47-60	25-40	1.30-1.50	0.2-0.6	0.12-0.17	3.6-5.0	<2	Moderate-----	0.32		
	47-64	18-40	1.40-1.60	0.06-0.2	0.10-0.17	3.6-5.0	<2	Moderate-----	0.32		
KmD-------------- Kisatchie	0-6	5-20	1.35-1.65	2.0-6.0	0.11-0.15	4.5-5.5	<2	Low----------	0.32	3	.5-2
	6-36	40-60	1.20-1.70	<0.06	0.15-0.18	3.6-5.0	<2	High---------	0.32		
	36-40	---	---	---	---	---	---	-------------	----		

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
									K	T	
	In	Pct	G/cc	In/hr	In/in	pH	Mmhos/cm				Pct
Ko	0-17	6-17	1.40-1.60	0.2-0.6	0.12-0.18	3.6-5.5	<2	Low	0.49	5	<1
Koury	17-50	6-17	1.45-1.65	0.2-0.6	0.12-0.18	3.6-5.5	<2	Low	0.49		
	50-70	6-27	1.45-1.65	0.2-0.6	0.12-0.18	3.6-5.5	<4	Low	0.49		
Kp	0-24	6-17	1.40-1.60	0.2-0.6	0.12-0.18	3.6-5.5	<2	Low	0.49	5	<1
Koury	24-45	6-17	1.45-1.65	0.2-0.6	0.12-0.18	3.6-5.5	<2	Low	0.49		
	45-74	6-27	1.45-1.65	0.2-0.6	0.12-0.18	3.6-5.5	<4	Low	0.49		
Ks:											
Koury	0-14	6-17	1.40-1.60	0.2-0.6	0.12-0.18	3.6-5.5	<2	Low	0.49	5	<1
	14-48	6-17	1.45-1.65	0.2-0.6	0.12-0.18	3.6-5.5	<2	Low	0.49		
	48-62	6-27	1.45-1.65	0.2-0.6	0.12-0.18	3.6-5.5	<4	Low	0.49		
Urban land.											
KuB	0-27	3-10	1.45-1.65	0.6-2.0	0.10-0.15	5.1-6.5	<2	Low	0.43	4	<1
Kurth	27-33	15-25	1.50-1.70	0.2-0.6	0.11-0.18	5.1-6.0	<2	Low	0.37		
	33-56	25-35	1.50-1.70	0.06-0.2	0.15-0.20	4.5-5.5	<2	Moderate	0.37		
	56-65	---	---	---	---	---	---	------------	----		
KwB:											
Kurth	0-28	3-10	1.45-1.65	0.6-2.0	0.10-0.15	5.1-6.5	<2	Low	0.43	4	<1
	28-54	25-35	1.50-1.70	0.06-0.2	0.15-0.20	4.5-5.5	<2	Moderate	0.37		
	54-60	---	---	---	---	---	---	------------	----		
Urban land.											
LaB	0-2	30-40	1.30-1.40	0.06-0.2	0.14-0.20	5.1-6.0	<2	High	0.32	5	1-3
Lacerda	2-42	60-70	1.40-1.50	<0.06	0.12-0.18	4.5-7.3	<2	High	0.32		
	42-60	60-70	1.45-1.55	<0.06	0.12-0.18	5.6-8.4	<2	High	0.32		
LeC	0-35	2-8	1.50-1.65	6.0-20	0.06-0.10	4.5-6.0	<2	Low	0.20	5	.5-1
Letney	35-80	18-32	1.55-1.70	2.0-6.0	0.12-0.17	4.5-6.0	<2	Low	0.24		
LtB	0-7	3-15	1.50-1.60	6.0-20	0.07-0.12	4.5-6.5	<2	Low	0.20	5	<2
Lilbert	7-31	3-15	1.50-1.65	6.0-20	0.07-0.11	4.5-6.5	<2	Low	0.20		
	31-65	20-35	1.55-1.69	0.6-2.0	0.13-0.17	4.5-6.0	<2	Low	0.24		
Ma	0-5	28-32	1.50-1.60	0.6-2.0	0.10-0.15	4.5-5.5	<2	Low	0.28	5	1-3
Mantachie	5-40	18-34	1.50-1.60	0.6-2.0	0.14-0.20	4.5-5.5	<2	Low	0.28		
	40-60	40-55	1.45-1.55	0.06-0.2	0.12-0.18	4.5-5.5	<2	High	0.32		
Me	0-9	5-20	1.50-1.55	0.6-2.0	0.14-0.18	5.6-7.8	<2	Low	0.28	5	2-4
Marietta	9-60	18-30	1.40-1.55	0.6-2.0	0.14-0.20	5.6-7.8	<2	Low	0.28		
Mf	0-10	5-20	1.50-1.55	0.6-2.0	0.14-0.18	5.6-7.8	<2	Low	0.28	5	2-4
Marietta	10-60	18-30	1.40-1.55	0.6-2.0	0.14-0.20	5.6-7.8	<2	Low	0.28		
MhB	0-9	1-8	1.10-1.30	6.0-20	0.03-0.10	4.5-5.5	<2	Low	0.10	5	2-4
Melhomes	9-65	1-8	1.20-1.40	>20	0.02-0.08	4.5-5.5	<2	Low	0.10		
MoA	0-12	10-20	1.40-1.65	0.2-0.6	0.15-0.20	4.5-6.0	<2	Low	0.37	5	.5-1
Mollville	12-65	22-35	1.50-1.69	0.06-0.2	0.15-0.20	4.5-7.8	<4	Moderate	0.32		
Mp:											
Mollville	0-10	10-20	1.40-1.65	0.2-0.6	0.15-0.20	4.5-6.0	<2	Low	0.37	5	.5-1
	10-65	22-35	1.50-1.69	0.06-0.2	0.15-0.20	4.5-7.8	<4	Moderate	0.32		
Besner	0-32	5-15	1.20-1.40	2.0-6.0	0.11-0.15	4.5-6.5	<2	Low	0.24	5	<1
	32-60	14-18	1.30-1.50	0.6-2.0	0.15-0.20	4.5-6.5	<2	Low	0.32		

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH	Mmhos/cm				Pct
MsB-------------- Moswell	0-5	8-12	1.25-1.50	0.6-2.0	0.12-0.18	4.5-6.0	<2	Low---------	0.49	5	<1
	5-23	60-70	1.20-1.40	<0.06	0.11-0.17	3.6-5.5	<2	High--------	0.32		
	23-45	60-70	1.20-1.40	<0.06	0.08-0.11	3.6-5.0	2-8	High--------	0.32		
	45-70	60-80	1.20-1.40	<0.06	0.08-0.11	3.6-5.5	2-8	High--------	0.32		
MsD-------------- Moswell	0-5	8-12	1.25-1.50	0.6-2.0	0.12-0.18	4.5-6.0	<2	Low---------	0.49	5	<1
	5-50	60-70	1.20-1.40	<0.06	0.11-0.17	3.6-5.5	<2	High--------	0.32		
	50-60	60-80	1.20-1.40	<0.06	0.08-0.11	3.6-5.5	2-8	High--------	0.32		
MuB:											
Moswell---------	0-7	8-12	1.25-1.50	0.6-2.0	0.12-0.18	4.5-6.0	<2	Low---------	0.49	5	<1
	7-48	60-70	1.20-1.40	<0.06	0.11-0.17	3.6-5.5	<2	High--------	0.32		
	48-60	60-80	1.20-1.40	<0.06	0.08-0.11	3.6-5.5	2-8	High--------	0.32		
Urban land.											
Mx:											
Moten-----------	0-26	6-12	1.40-1.65	0.6-2.0	0.11-0.15	4.5-6.0	<2	Low---------	0.43	5	.5-2
	26-52	10-18	1.40-1.65	0.2-0.6	0.13-0.20	4.5-6.0	<2	Low---------	0.49		
	52-65	15-40	1.30-1.60	0.06-0.2	0.12-0.18	4.5-7.3	<4	Moderate----	0.49		
Multey----------	0-25	4-10	1.30-1.50	0.6-2.0	0.10-0.18	4.5-6.5	<2	Low---------	0.43	5	<1
	25-38	8-18	1.40-1.60	0.6-2.0	0.11-0.20	4.5-5.5	<2	Low---------	0.43		
	38-65	12-25	1.40-1.60	0.6-2.0	0.12-0.20	4.5-6.0	<2	Low---------	0.37		
	65-70	8-35	1.40-1.65	0.6-6.0	0.10-0.17	4.5-8.4	<4	Low---------	0.28		
NaD-------------- Naclina	0-3	40-45	1.30-1.40	<0.06	0.12-0.18	5.1-7.3	<2	High--------	0.32	5	.5-2
	3-45	40-60	1.40-1.50	<0.06	0.12-0.18	5.1-8.4	<2	High--------	0.32		
	45-60	40-60	1.40-1.55	<0.06	0.12-0.18	6.6-8.4	<2	High--------	0.32		
Oz--------------- Ozias	0-10	40-60	1.35-1.50	<0.06	0.12-0.16	3.6-5.0	<8	High--------	0.32	5	<2
	10-44	35-60	1.35-1.50	<0.06	0.12-0.16	3.6-5.0	<8	High--------	0.32		
	44-80	35-60	1.35-1.50	<0.06	0.12-0.16	3.6-9.0	2-16	High--------	0.32		
Pa. Pits											
Po--------------- Pophers	0-10	20-40	1.30-1.50	0.2-0.6	0.14-0.20	3.6-6.0	<4	Moderate----	0.49	5	<2
	10-46	20-35	1.35-1.60	0.2-0.6	0.12-0.18	3.6-6.0	<8	Moderate----	0.49		
	46-80	27-45	1.40-1.65	0.06-0.2	0.10-0.15	3.6-6.0	4-16	Moderate----	0.49		
RaB-------------- Rayburn	0-8	8-20	1.20-1.40	0.6-2.0	0.11-0.15	4.5-6.0	<2	Low---------	0.43	3	<1
	8-50	40-60	1.30-1.50	<0.06	0.12-0.18	3.6-5.5	<2	High--------	0.37		
	50-60	---	---	---	---	---	---	------------	----		
RaD-------------- Rayburn	0-6	8-20	1.20-1.40	0.6-2.0	0.11-0.15	4.5-6.0	<2	Low---------	0.43	3	<1
	6-47	40-60	1.30-1.50	<0.06	0.12-0.18	3.6-5.5	<2	High--------	0.37		
	47-60	---	---	---	---	---	---	------------	----		
RkB-------------- Raylake	0-4	30-40	1.25-1.40	0.2-0.6	0.14-0.20	4.5-6.0	<2	Moderate----	0.32	5	<1
	4-11	45-60	1.30-1.40	<0.06	0.12-0.18	3.6-6.0	<2	Very high	0.32		
	11-51	45-60	1.30-1.45	<0.06	0.12-0.18	4.5-7.3	<4	Very high	0.32		
	51-65	45-60	1.35-1.55	<0.06	0.10-0.16	4.5-8.4	2-8	High--------	0.32		
RnB-------------- Rentzel	0-24	5-15	1.40-1.65	6.0-20	0.07-0.11	5.1-6.5	<2	Low---------	0.17	5	<1
	24-60	15-35	1.50-1.70	0.2-0.6	0.12-0.17	3.6-5.5	<2	Low---------	0.32		
RoB-------------- Rosenwall	0-7	8-20	1.40-1.60	2.0-6.0	0.11-0.15	4.5-6.5	<2	Low---------	0.43	2	.5-2
	7-27	60-70	1.30-1.60	<0.06	0.12-0.18	4.5-6.0	<2	High--------	0.32		
	27-60	---	---	---	---	---	---	------------	----		

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
									K	T	
	In	Pct	G/cc	In/hr	In/in	pH	Mmhos/cm				Pct
RoD--------------	0-6	8-20	1.40-1.60	2.0-6.0	0.11-0.15	4.5-6.5	<2	Low----------	0.43	2	.5-2
Rosenwall	6-25	60-70	1.30-1.60	<0.06	0.12-0.18	4.5-6.0	<2	High---------	0.32		
	25-60	---	---	---	---	---	---	-------------	----		
SaB--------------	0-8	5-25	1.30-1.50	0.6-2.0	0.10-0.20	4.5-6.0	<2	Low----------	0.32	5	1-3
Sacul	8-56	35-60	1.20-1.35	0.06-0.2	0.12-0.18	4.5-5.5	<2	High---------	0.32		
	56-65	20-40	1.25-1.45	0.2-0.6	0.16-0.24	4.5-5.5	<2	Moderate-----	0.37		
SaD--------------	0-9	5-25	1.30-1.50	0.6-2.0	0.10-0.20	4.5-6.0	<2	Low----------	0.32	5	1-3
Sacul	9-44	35-60	1.20-1.35	0.06-0.2	0.12-0.18	4.5-5.5	<2	High---------	0.32		
	44-60	20-40	1.25-1.45	0.2-0.6	0.16-0.24	4.5-5.5	<2	Moderate-----	0.37		
SbB:											
Sacul------------	0-9	5-25	1.30-1.50	0.6-2.0	0.10-0.20	4.5-6.0	<2	Low----------	0.32	5	1-3
	9-54	35-60	1.20-1.35	0.06-0.2	0.12-0.18	4.5-5.5	<2	High---------	0.32		
	54-60	20-40	1.25-1.45	0.2-0.6	0.16-0.24	4.5-5.5	<2	Moderate-----	0.37		
Urban land.											
StD--------------	0-12	8-18	1.20-1.40	0.6-2.0	0.11-0.15	4.5-6.5	<2	Low----------	0.32	3	<1
Stringtown	12-50	20-35	1.35-1.55	0.6-2.0	0.15-0.20	4.5-5.5	<2	Low----------	0.28		
	50-65	---	---	---	---	---	---	-------------	----		
StF--------------	0-9	8-18	1.20-1.40	0.6-2.0	0.11-0.15	4.5-6.5	<2	Low----------	0.32	3	<1
Stringtown	9-41	20-35	1.35-1.55	0.6-2.0	0.15-0.20	4.5-5.5	<2	Low----------	0.28		
	41-60	---	---	---	---	---	---	-------------	----		
TeD--------------	0-53	2-8	1.50-1.65	6.0-20	0.06-0.10	4.5-6.0	<2	Low----------	0.20	5	<1
Tehran	53-70	18-32	1.55-1.70	2.0-6.0	0.12-0.17	4.5-6.0	<2	Low----------	0.24		
TnD--------------	0-25	3-15	1.50-1.65	6.0-20	0.07-0.11	5.1-6.5	<2	Low----------	0.17	3	<1
Tehran	25-56	22-35	1.50-1.65	0.6-2.0	0.12-0.17	4.5-5.5	<2	Low----------	0.24		
	56-65	10-30	1.60-1.75	0.2-0.6	0.08-0.14	4.5-5.5	<2	Low----------	0.24		
WoB--------------	0-4	5-20	1.20-1.40	0.6-2.0	0.10-0.15	4.5-6.5	<2	Low----------	0.43	4	<1
Woodtell	4-41	40-60	1.30-1.50	<0.06	0.12-0.18	3.6-5.5	<2	High---------	0.32		
	41-60	30-50	1.30-1.50	0.06-0.2	0.12-0.20	4.5-6.0	<2	High---------	0.32		
	45-72	15-50	1.35-1.65	0.06-0.2	0.10-0.15	4.5-7.3	<2	High---------	0.32		
WoD--------------	0-8	5-20	1.20-1.40	0.6-2.0	0.10-0.15	4.5-6.5	<2	Low----------	0.43	4	<1
Woodtell	8-51	40-60	1.30-1.50	<0.06	0.12-0.18	3.6-5.5	<2	High---------	0.32		
	51-65	30-50	1.30-1.50	0.06-0.2	0.12-0.20	4.5-6.0	<2	High---------	0.32		
	45-72	15-50	1.35-1.65	0.06-0.2	0.10-0.15	4.5-7.3	<2	High---------	0.32		

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
AaB: Alazan	B	None	---	---	1.5-2.5	Apparent	Jan-Apr	>60	---	High	Moderate.
Ab:											
Alazan	B	None	---	---	1.5-2.5	Apparent	Jan-Apr	>60	---	High	Moderate.
Besner	B	None	---	---	4.0-6.0	Apparent	Jan-Feb	>60	---	Low	Moderate.
AcB:											
Alazan	B	None	---	---	1.5-2.5	Apparent	Jan-Apr	>60	---	High	Moderate.
Urban land.											
AtB, AtD: Attoyac	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
BaB: Bernaldo	B	None	---	---	4.0-6.0	Apparent	Nov-Feb	>60	---	Moderate	Moderate.
Bb:											
Bernaldo	B	None	---	---	4.0-6.0	Apparent	Nov-Feb	>60	---	Moderate	Moderate.
Besner	B	None	---	---	4.0-6.0	Apparent	Jan-Feb	>60	---	Low	Moderate.
BnB: Bienville	A	None	---	---	4.0-6.0	Apparent	Dec-Apr	>60	---	Low	Moderate.
BrC, BrD: Browndell	D	None	---	---	>6.0	---	---	14-20	Soft	High	High.
CoB: Corrigan	D	None	---	---	0-3.0	Perched	Dec-Mar	20-40	Soft	High	High.
CtD, CtF, CuD: Cuthbert	C	None	---	---	>6.0	---	---	>60	---	High	High.
DaC, DaD: Darco	A	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
DbA, DbB: Diboll	D	None	---	---	0.5-1.5	Perched	Jan-Apr	40-60	Soft	High	High.
Du. Dumps											
EtB: Etoile	D	None	---	---	0-2.0	Perched	Jan-May	>60	---	High	Moderate.
FfA, FfB: Fuller	D	None	---	---	0.5-1.5	Perched	Jan-Apr	40-60	Soft	High	High.
FuB:											
Fuller	D	None	---	---	0.5-1.5	Perched	Jan-Apr	40-60	Soft	High	High.
Urban land.											

TABLE 16.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
HeA, HeB Herty	D	None	---	---	0-0.5	Perched	Jan-Apr	>60	---	High	High.
HuB: Herty	D	None	---	---	0-0.5	Perched	Jan-Apr	>60	---	High	High.
Urban land.											
Iu Iuka	C	Occasional	Very brief to brief.	Dec-Apr	1.0-3.0	Apparent	Dec-Apr	>60	---	Moderate	High.
KaB Keithville	C	None	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	High	Moderate.
Kb: Keithville	C	None	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	High	Moderate.
Sawtown	C	None	---	---	3.5-5.0	Perched	Jan-Mar	>60	---	Moderate	Moderate.
KcB, KcD Keltys	B	None	---	---	2.5-3.5	Perched	Jan-Apr	40-60	Soft	High	High.
KdB, KdD: Keltys	B	None	---	---	2.5-3.5	Perched	Jan-Apr	40-60	Soft	High	High.
Urban land.											
KfB, KgB Kirvin	C	None	---	---	>6.0	---	---	>60	---	High	High.
KhB Kirvin	D	None	---	---	>6.0	---	---	>60	---	High	High.
KmD Kisatchie	D	None	---	---	>6.0	---	---	20-40	Soft	High	High.
Ko Koury	C	Occasional	Very brief to long.	Jan-Jun	1.5-2.5	Apparent	Jan-Apr	>60	---	High	High.
Kp Koury	C	Frequent	Very brief to long.	Jan-Jun	1.5-2.5	Apparent	Jan-Apr	>60	---	High	High.
Ks: Koury	C	Occasional	Very brief to long.	Jan-Jun	1.5-2.5	Apparent	Jan-Apr	>60	---	High	High.
Urban land.											
KuB Kurth	C	None	---	---	2.5-3.5	Perched	Jan-Apr	40-60	Soft	High	Moderate.
KwB: Kurth	C	None	---	---	2.5-3.5	Perched	Jan-Apr	40-60	Soft	High	Moderate.
Urban land.											
LaB Lacerda	D	None	---	---	0-2.0	Perched	Jan-May	>60	---	High	Moderate.
LeC Letney	A	None	---	---	>6.0	---	---	>60	---	Low	High.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
LtB------------- Lilbert	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High.
Ma-------------- Mantachie	C	Frequent----	Brief-----	Jan-Mar	1.0-1.5	Apparent	Dec-Mar	>60	---	High-----	High.
Me-------------- Marietta	C	Occasional	Brief-----	Jan-Mar	1.5-2.0	Apparent	Jan-Mar	>60	---	Moderate	Low.
Mf-------------- Marietta	C	Frequent----	Brief-----	Jan-Mar	1.5-2.0	Apparent	Jan-Mar	>60	---	Moderate	Low.
MhB------------- Melhomes	D	Frequent----	Brief-----	Dec-May	0-1.0	Apparent	Jan-Dec	>60	---	High-----	High.
MoA------------- Mollville	D	None--------	---	---	+.5-1.0	Perched	Nov-Jun	>60	---	High-----	High.
Mp:											
Mollville------	D	None--------	---	---	+.5-1.0	Perched	Nov-Jun	>60	---	High-----	High.
Besner---------	B	None--------	---	---	4.0-6.0	Apparent	Jan-Feb	>60	---	Low------	Moderate.
MsB, MsD-------- Moswell	D	None--------	---	---	3.5-5.0	Apparent	Jan-Mar	>60	---	High-----	High.
MuB:											
Moswell--------	D	None--------	---	---	3.5-5.0	Apparent	Jan-Mar	>60	---	High-----	High.
Urban land.											
Mx:											
Moten----------	C	None--------	---	---	0.5-1.5	Perched	Jan-Apr	>60	---	High-----	Moderate.
Multey---------	B	None--------	---	---	2.5-3.5	Perched	Jan-Mar	>60	---	High-----	Moderate.
NaD------------- Naclina	D	None--------	---	---	0-2.0	Perched	Jan-Apr	>60	---	High-----	Moderate.
Oz-------------- Ozias	D	Frequent----	Long------	Dec-May	1.0-2.0	Apparent	Nov-May	>60	---	High-----	High.
Pa. Pits											
Po-------------- Pophers	C	Frequent----	Long------	Jan-Jun	1.0-2.0	Apparent	Dec-May	>60	---	High-----	High.
RaB, RaD-------- Rayburn	D	None--------	---	---	2.5-4.5	Perched	Dec-Feb	40-60	Soft	High-----	High.
RkB------------- Raylake	D	None--------	---	---	0-2.0	Perched	Jan-May	>60	---	High-----	High.
RnB------------- Rentzel	C	None--------	---	---	1.5-2.5	Perched	Jan-Mar	>60	---	High-----	High.
RoB, RoD-------- Rosenwall	D	None--------	---	---	>6.0	---	---	20-40	Soft	High-----	High.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
SaB SaD--------- Sacul	C	None---------	---	---	2.0-4.0	Apparent	Dec-Apr	>60	---	High------	Moderate.
SbB:											
Sacul-----------	C	None---------	---	---	2.0-4.0	Apparent	Dec-Apr	>60	---	High------	Moderate.
Urban land.											
StD, StF--------- Stringtown	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High.
TeD------------- Tehran	A	None---------	---	---	>6.0	---	---	>60	---	Low-------	High.
TnD------------- Tenaha	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
WoB, WoD--------- Woodtell	D	None---------	---	---	>6.0	---	---	>60	---	High------	High.

TABLE 17.--PHYSICAL ANALYSES OF SELECTED SOILS

[Determined by the National Soil Survey Laboratory, Lincoln, Nebraska, except the Koury soils data were determined by the Texas A&M University Soil Characterization Laboratory, College Station, Texas. A dash indicates material was not detected. TR indicates trace]

Soil series and sample numbers *	Depth	Horizon	Particle-size distribution: Sand: Very coarse (2.1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	Total (2-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Water content: 1/3 bar	15 bar
	In		Mm	Mm	Mm	Mm	Mm	Mm	Mm	Mm	-Pct (wt)-	
Diboll												
(S80TX-005-004)	0-9	A	TR	0.1	0.7	9.7	35.7	46.2	48.1	5.7	12.2	2.9
	9-17	E1	TR	0.1	0.7	8.7	36.8	46.3	48.9	4.8	14.9	2.6
	17-29	E2	TR	0.1	0.8	9.1	33.8	43.8	48.5	7.7	14.1	4.2
	29-36	Btn/E	TR	0.1	0.3	4.1	18.4	22.9	43.4	33.7	28.1	18.2
	36-43	2Cr/Btn	0.1	0.1	0.2	3.4	16.4	20.2	41.0	38.8	32.9	19.3
	43-55	3Cr1	---	---	0.1	1.1	9.4	10.6	40.9	48.5	33.9	25.9
	55-67	3Cr2	0.1	0.1	0.1	0.7	7.9	8.9	40.8	50.3	32.6	27.2
Fuller												
(S80TX-005-010)	0-6	A	0.1	0.2	1.8	34.5	26.7	63.3	32.6	4.1	---	2.9
	6-18	Eg1	---	---	1.3	34.5	29.1	64.9	32.3	2.8	9.4	1.6
	18-24	Eg2	0.1	0.1	1.4	32.8	27.2	61.6	29.0	9.4	10.9	4.3
	24-34	Eg3	---	0.1	1.5	35.1	27.6	64.3	29.2	6.5	10.5	3.1
	34-39	Eg4	---	0.1	1.4	35.4	28.7	65.6	27.9	6.5	10.5	3.2
	39-47	Btng/E	---	0.1	0.1	27.8	20.3	49.2	31.3	19.5	27.8	9.9
	47-58	2Cr/Btz	0.3	0.1	0.9	24.5	13.7	39.5	28.2	32.3	33.3	18.2
	58-70	2Cryz	---	---	0.9	25.8	9.8	36.5	28.6	35.0	35.7	20.3
Herty												
(S80TX-005-009)	0-3	A	0.6	0.6	2.8	22.9	34.1	61.0	29.4	9.6	18.0	5.1
	3-11	Bt1	0.2	0.2	0.9	14.1	23.2	38.4	26.6	35.0	23.6	13.9
	11-21	Bt2	0.1	0.1	0.7	14.6	21.2	36.7	27.6	35.7	22.7	13.6
	21-25	Bt3	---	0.1	0.6	11.4	15.8	27.9	24.8	47.3	27.1	17.7
	25-30	Bty	1.0	2.7	2.5	4.6	4.6	15.4	22.0	62.6	32.6	20.6
	30-44	B/Cy	0.2	0.2	0.3	1.1	1.5	3.3	20.1	75.6	42.9	27.7
	44-57	Cy1	---	0.2	0.1	0.2	0.7	1.2	23.7	75.1	45.1	28.3
	57-70	Cy2	0.1	0.1	0.1	0.2	2.3	2.8	22.2	75.0	48.7	29.2
Koury												
(S80TX-005-011)	0-3	A1	---	0.4	1.0	9.8	27.8	39.0	50.2	10.8	---	---
	3-10	A2	---	0.1	0.8	13.0	34.4	48.3	45.2	6.5	17.9	---
	10-17	A3	---	0.1	0.8	10.9	31.9	43.7	47.1	9.2	17.2	---
	17-28	Bw	---	---	0.9	6.7	21.8	29.4	56.8	14.3	21.4	---
	28-50	Bg	---	0.1	1.3	7.9	21.3	30.6	57.6	11.6	18.7	---
	50-70	Cg	---	0.2	1.2	7.9	19.5	28.8	56.5	14.7	21.5	---
Moswell												
(S80TX-005-008)	0-2	A	3.3	2.1	3.2	18.8	24.5	51.9	38.7	9.4	---	11.0
	2-5	E	1.0	0.5	1.2	18.4	27.7	48.8	41.8	9.4	14.8	4.7
	5-12	Bt1	---	0.1	0.2	3.4	6.1	9.8	27.6	62.6	39.6	25.3
	12-23	Bt2	0.2	0.1	0.2	0.6	2.1	3.2	30.6	66.2	40.6	27.9
	23-31	Bty1	1.7	1.8	1.2	1.3	1.6	7.6	25.6	66.8	42.7	29.0
	31-37	Bty2	0.2	0.7	1.0	1.0	0.9	3.8	27.9	68.3	36.6	25.4
	37-45	BCy	0.2	1.1	2.0	1.4	1.0	5.7	31.8	62.5	36.5	24.5
	45-57	Cy1	0.1	0.4	0.3	0.5	0.5	1.8	31.0	67.2	42.3	26.8
	57-70	Cy2	TR	0.1	0.2	0.2	0.3	0.8	26.1	73.1	42.2	29.9

* Locations of all soils are the same as that described for the series in the section "Soil Series and Their Morphology."

TABLE 18.--CHEMICAL ANAYLSES OF SELECTED SOILS

[Determined by the National Soil Survey Laboratory, Lincoln, Nebraska, except the Koury soils data were determined by the Texas A&M University Soil Characterization Laboratory, College Station, Texas. A dash indicates material was not detected. TR indicates trace]

Soil series and sample numbers *	Depth	Horizon	Extractable bases: Ca	Extractable bases: Mg	Extractable bases: Na	Extractable bases: K	Extractable bases: Sum	Acidity	Extractable aluminum	Base saturation: Sum of cations	Base saturation: Ammonium acetate	pH: H_2O (1:1)	pH: $CaCl_2$ 0.1m (1:2)	Sodium adsorption ratio	Electrical conductivity
	In		---Milliequivalents/100 grams of soil----							Pct	Pct			Pct	Mmh/cm
Diboll															
(S80TX-005-004)	0-9	A	1.4	0.7	---	0.1	2.2	3.3	0.8	40	59	4.9	4.2	---	0.02
	9-17	E1	1.3	0.8	TR	TR	2.1	3.0	0.8	41	55	4.8	4.1	---	0.01
	17-29	E2	1.9	1.1	0.4	0.1	3.5	3.3	0.7	51	64	5.1	4.3	---	0.05
	29-36	Btn/E	11.5	5.4	5.2	0.4	22.5	3.6	---	86	100	6.2	6.2	14	1.80
	36-43	2Cr/Btn	16.1	7.3	7.5	0.5	31.4	3.1	---	91	100	6.8	6.8	15	2.33
	43-55	3Cr1	18.6	8.4	9.3	0.7	37.0	3.3	---	92	100	7.3	7.4	16	2.79
	55-67	3Cr2	19.9	9.1	9.9	0.8	39.7	4.0	---	91	100	7.3	7.5	15	2.33
Fuller															
(S80TX-005-010)	0-6	A	0.8	0.4	---	0.1	1.3	4.4	0.6	23	32	4.9	4.3	---	0.04
	6-18	Eg1	0.2	0.4	---	TR	0.6	1.8	0.3	25	33	4.9	4.3	---	0.02
	18-24	Eg2	2.1	1.1	0.2	TR	3.4	3.7	0.5	48	62	5.0	4.2	---	0.04
	24-34	Eg3	1.6	0.9	0.5	TR	3.0	2.0	0.1	60	79	5.4	4.5	---	0.11
	34-39	Eg4	2.1	1.1	1.0	TR	4.2	1.9	---	69	95	6.4	5.6	---	0.18
	39-47	Btng/E	7.2	4.0	3.0	0.2	14.4	2.7	---	84	100	7.2	6.7	12	1.65
	47-58	2Cr/Btz	24.8	7.6	5.2	0.4	38.0	3.1	---	92	100	7.6	7.7	13	1.44
	58-70	2Cryz	16.2	7.3	4.5	0.4	28.8	3.3	---	90	100	8.0	7.9	13	1.14
Herty															
(S80TX-005-009)	0-3	A	3.7	1.6	0.2	0.2	5.7	6.2	0.3	48	69	4.8	4.4	---	0.11
	3-11	Bt1	4.7	5.6	2.2	0.4	12.9	12.3	4.7	51	64	4.5	4.0	9	1.05
	11-21	Bt2	5.9	7.5	4.4	0.4	18.2	7.7	2.0	70	92	4.2	4.0	13	2.89
	21-25	Bt3	---	10.3	7.3	0.6	---	---	0.9	---	100	4.0	4.0	10	6.78
	25-30	Bty	---	17.2	11.4	0.9	---	---	0.4	---	100	4.2	4.2	11	7.28
	30-44	B/Cy	---	20.8	14.6	1.1	---	---	0.1	---	100	4.5	4.5	11	7.63
	44-57	Cy1	---	24.4	17.7	1.2	---	---	---	---	100	5.2	5.2	13	8.53
	57-70	Cy2	---	24.5	18.2	1.3	---	---	---	---	100	5.5	5.6	12	8.54
Koury															
(S80TX-005-011)	0-3	A1	1.7	0.7	0.2	0.2	2.8	---	4.1	24	---	4.1	---	---	---
	3-10	A2	0.1	0.2	0.2	0.1	0.6	---	2.9	8	---	4.2	---	---	---
	10-17	A3	0.1	0.7	0.2	0.1	1.1	---	3.3	13	---	4.4	---	---	---
	17-28	Bw	0.4	0.7	0.2	0.2	1.5	---	5.6	14	---	4.1	---	---	---
	28-50	Bg	0.6	0.6	0.5	0.1	1.8	---	3.6	18	---	3.5	---	---	---
	50-70	Cg	2.7	1.2	1.0	0.2	5.1	---	3.3	46	---	3.4	---	---	---
Moswell															
(S80TX-005-008)	0-2	A	13.4	1.6	0.2	0.3	15.5	8.7	---	64	92	5.9	5.5	---	0.18
	2-5	E	1.8	0.8	0.2	0.2	3.0	6.0	2.3	33	45	4.6	3.9	---	0.04
	5-12	Bt1	9.1	4.9	1.6	0.7	16.3	26.3	14.5	38	45	4.7	3.9	---	0.06
	12-23	Bt2	14.6	6.9	2.9	0.9	25.3	22.1	9.9	53	63	4.2	3.7	---	0.22
	23-31	Bty1	17.4	8.0	4.5	0.9	30.8	20.0	4.5	61	80	4.0	3.8	8	2.10
	31-37	Bty2	---	8.8	6.0	1.0	15.8	---	2.1	---	44	3.7	3.7	6	5.16
	37-45	BCy	---	10.5	7.2	1.0	18.7	---	1.4	---	56	3.7	3.7	8	5.57
	45-57	Cy1	---	12.5	8.4	1.2	22.1	---	1.1	---	58	3.9	3.8	8	5.99
	57-70	Cy2	26.0	13.5	9.7	1.3	50.5	9.3	0.8	84	100	4.0	4.0	8	5.64

* Locations of all soils are the same as that described for the series in the section "Soil Series and Their Morphology."

TABLE 19.--ENGINEERING INDEX TEST DATA

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution: Percentage passing sieve--			Grain-size distribution: Percentage smaller than--			Liquid limit	Plasticity index	Particle density	Shrinkage		
	AASHTO	Unified	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm				Limit	Linear	Ratio
									Pct		G/cc	Pct	Pct	Pct
Diboll very fine sandy loam 1/: (S79TX-005-001)														
E1 -- 9-17	A-4(3)	CL-ML	100	100	81	54	9	8	24	5	2.64	21.0	2.2	1.65
E2 -- 17-29	A-4(2)	ML	100	100	81	61	9	8	24	3	2.62	21.0	1.4	1.62
Btn/E -- 29-36	A-6(11)	CL	100	100	84	65	20	18	35	14	2.65	21.0	6.7	1.66
Diboll very fine sandy loam 2/: (S80TX-005-006)														
E1 -- 9-17	A-4(1)	ML	100	99	76	52	7	5	21	3	2.62	19.0	1.5	1.74
Btn/E -- 32-40	A-7-6(33)	CH	100	100	87	68	27	27	52	35	2.57	19.0	14.1	1.80
Fuller fine sandy loam 1/: (S80TX-005-010)														
Eg1 6-18	A-4(0)	SM	100	100	49	33	0	0	21	2	2.58	18.0	1.8	1.71
Btng/E -- 39-47	A-7-6(22)	CH	100	100	62	46	24	20	56	37	2.64	22.0	14.1	1.68
Herty very fine sandy loam 3/: (S79TX-005-002)														
E -- 3-8	A-6(12)	CL	100	99	89	72	28	23	32	14	2.60	18.0	6.9	1.69
Bt2 -- 15-32	A-7-6(27)	CL	100	99	91	86	47	38	46	28	2.61	12.0	15.2	1.93
Keltys loamy fine sand 4/: (S80TX-005-007)														
Bt1/E -- 24-34	A-4(0)	SM-SC	100	98	43	28	10	10	23	4	2.62	19.0	2.5	1.75
Bt2/E -- 34-42	A-4(0)	SM-SC	100	99	39	25	10	10	22	4	2.65	20.0	1.2	1.76
Koury loam 1/: (S80TX-005-011)														
Bw -- 17-28	A-6(8)	CL	100	100	79	60	21	14	27	11	2.62	18.0	5.0	1.80
Bg -- 28-50	A-4(7)	CL	100	100	79	67	20	16	25	9	2.62	18.0	3.7	1.80
Moswell loam 1/: (S80TX-005-008)														
Bt1 -- 5-12	A-7-5(46)	CH	100	100	95	85	65	62	70	39	2.61	9.0	24.5	2.16
Bt2 -- 12-23	A-7-5(74)	CH	100	100	99	92	75	65	92	62	2.57	18.0	24.5	1.79
Cy1 -- 45-57	A-7-6(69)	CH	100	99	96	92	73	61	90	61	2.79	26.0	21.5	1.66
Ozias silty clay 1/: (S80TX-005-001)														
Bg1 -- 10-18	A-7-6(27)	CL	100	100	99	82	37	29	45	24	2.64	23.0	9.3	1.65
Bg2 -- 18-44	A-7-6(41)	CH	100	100	100	93	65	50	60	34	2.64	20.0	16.1	1.73
Pophers silty clay loam 1/: (S82TX-005-002)														
Bg1 -- 10-24	A-6(12)	CL	100	100	86	49	30	19	34	15	2.67	23.0	5.1	1.68
Bg2 -- 24-46	A-6(9)	CL	100	100	87	65	26	18	30	13	2.59	21.0	4.8	1.71

1/ Location of pedon sample is the same as the pedon given as typical for series in "Soil Series and Their Morphology."

2/ About 10 miles south of Lufkin at the intersection of Farm Road 1818 and Farm Road 844; 0.9 mile west on Farm Road 1818, and 80 feet north into a pasture.

3/ About 10 miles south of Lufkin at the intersection of Farm Road 58 and Farm Road 844; 1 mile west on Farm Road 1818 to pipeline; 0.5 mile south on pipeline, and 20 feet east of pipeline.

4/ About 7 miles south of Lufkin on Farm Road 58 at The Beula Church; 1,800 feet east on a logging road. Taxadjunct to the Keltys series because the surface and subsurface layers are 24 inches of loamy fine sand.

TABLE 20.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Alazan	Fine-loamy, siliceous, thermic Aquic Glossudalfs
Attoyac	Fine-loamy, siliceous, thermic Typic Paleudalfs
Bernaldo	Fine-loamy, siliceous, thermic Glossic Paleudalfs
Besner	Coarse-loamy, siliceous, thermic Glossic Paleudalfs
Bienville	Sandy, siliceous, thermic Psammentic Paleudalfs
Browndell	Clayey, montmorillonitic, thermic, shallow Albaquic Hapludalfs
Corrigan	Fine, montmorillonitic, thermic Typic Albaqualfs
Cuthbert	Clayey, mixed, thermic Typic Hapludults
Darco	Loamy, siliceous, thermic Grossarenic Paleudults
Diboll	Fine-silty, siliceous, thermic Albic Glossic Natraqualfs
Etoile	Fine, montmorillonitic, thermic Vertic Hapludalfs
Fuller	Fine-loamy, siliceous, thermic Albic Glossic Natraqualfs
Herty	Fine, montmorillonitic, thermic Vertic Albaqualfs
Iuka	Coarse-loamy, siliceous, acid, thermic Aquic Udifluvents
*Keithville	Fine-silty, siliceous, thermic Glossaquic Paleudalfs
Keltys	Coarse-loamy, siliceous, thermic Aquic Glossudalfs
Kirvin	Clayey, mixed, thermic Typic Hapludults
Kisatchie	Fine, montmorillonitic, thermic Typic Hapludalfs
Koury	Coarse-silty, siliceous, thermic Fluvaquentic Dystrochrepts
Kurth	Fine-loamy, siliceous, thermic Aquic Glossudalfs
Lacerda	Very-fine, montmorillonitic, thermic Aquentic Chromuderts
Letney	Loamy, siliceous, thermic Arenic Paleudults
Lilbert	Loamy, siliceous, thermic Arenic Plinthic Paleudults
*Mantachie	Fine-loamy, siliceous, acid, thermic Aeric Fluvaquents
Marietta	Fine-loamy, siliceous, thermic Fluvaquentic Eutrochrepts
Melhomes	Siliceous, thermic Humaqueptic Psammaquents
Mollville	Fine-loamy, mixed, thermic Typic Glossaqualfs
Moswell	Very-fine, montmorillonitic, thermic Vertic Hapludalfs
Moten	Coarse-loamy, siliceous, thermic Aeric Glossaqualfs
Multey	Coarse-loamy, siliceous, thermic Aquic Glossudalfs
Naclina	Fine, montmorillonitic, thermic Aquentic Chromuderts
Ozias	Fine, montmorillonitic, acid, thermic Aeric Fluvaquents
Pophers	Fine-silty, siliceous, acid, thermic Aeric Fluvaquents
Rayburn	Fine, montmorillonitic, thermic Vertic Hapludalfs
Raylake	Fine, montmorillonitic, thermic Aquentic Chromuderts
Rentzel	Loamy, siliceous, thermic Arenic Plinthaquic Paleudults
Rosenwall	Clayey, mixed, thermic Aquic Hapludults
Sacul	Clayey, mixed, thermic Aquic Hapludults
*Sawtown	Fine-silty, siliceous, thermic Glossic Paleudalfs
Stringtown	Fine-loamy, siliceous, thermic Typic Hapludults
Tehran	Loamy, siliceous, thermic Grossarenic Paleudults
Tenaha	Loamy, siliceous, thermic Arenic Hapludults
Woodtell	Fine, montmorillonitic, thermic Vertic Hapludalfs

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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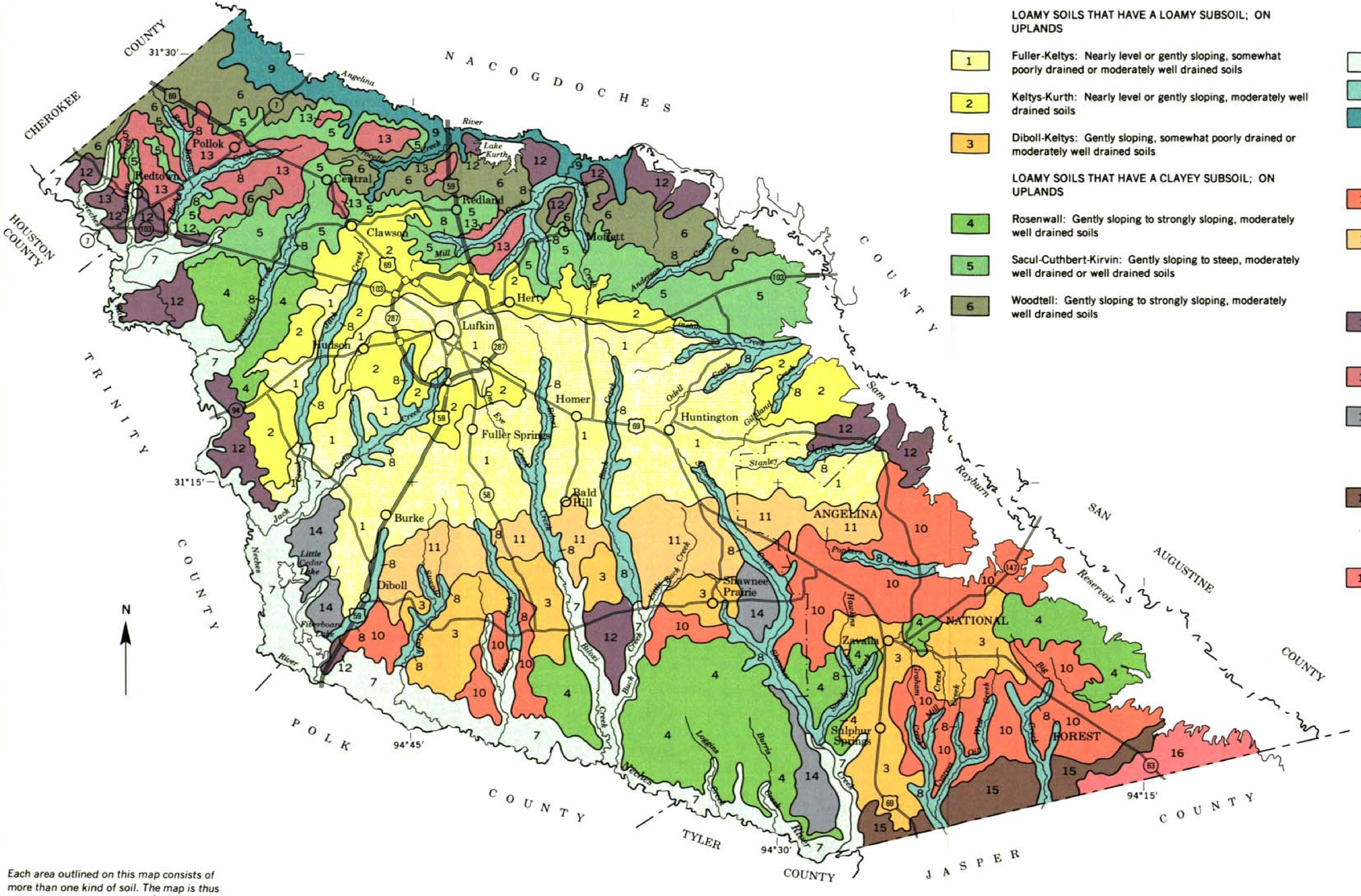


LEGEND

LOAMY SOILS THAT HAVE A LOAMY SUBSOIL; ON UPLANDS

1 — Fuller-Keltys: Nearly level or gently sloping, somewhat poorly drained or moderately well drained soils

2 — Keltys-Kurth: Nearly level or gently sloping, moderately well drained soils

3 — Diboll-Keltys: Gently sloping, somewhat poorly drained or moderately well drained soils

LOAMY SOILS THAT HAVE A CLAYEY SUBSOIL; ON UPLANDS

4 — Rosenwall: Gently sloping to strongly sloping, moderately well drained soils

5 — Sacul-Cuthbert-Kirvin: Gently sloping to steep, moderately well drained or well drained soils

6 — Woodtell: Gently sloping to strongly sloping, moderately well drained soils

CLAYEY OR LOAMY SOILS THAT HAVE A CLAYEY OR LOAMY SUBSURFACE LAYER; ON FLOOD PLAINS

7 — Ozias-Pophers: Nearly level, somewhat poorly drained soils

8 — Koury: Nearly level, moderately well drained soils

9 — Mantachie-Marietta: Nearly level, somewhat poorly drained or moderately well drained soils

LOAMY SOILS THAT HAVE A LOAMY OR CLAYEY SUBSOIL; ON TERRACES AND UPLANDS

10 — Alazan-Moswell: Nearly level to strongly sloping, somewhat poorly drained or moderately well drained soils

11 — Moswell-Bernaldo: Nearly level to strongly sloping, moderately well drained or well drained soils

LOAMY TO SANDY SOILS THAT HAVE A LOAMY OR SANDY SUBSOIL; ON TERRACES

12 — Besner-Mollville-Bienville: Nearly level or gently sloping, somewhat poorly drained to somewhat excessively drained soils

13 — Bernaldo-Keithville-Sawtown: Nearly level or gently sloping, somewhat poorly drained to well drained soils

14 — Moten-Multey: Nearly level, mounded, somewhat poorly drained or moderately well drained soils

LOAMY SOILS THAT HAVE A CLAYEY OR LOAMY SUBSOIL; ON UPLANDS

15 — Rayburn-Corrigan-Stringtown: Gently sloping to steep, well drained to somewhat poorly drained soils

SANDY OR LOAMY SOILS THAT HAVE A LOAMY SUBSOIL; ON UPLANDS

16 — Letney-Stringtown-Tehran: Gently sloping to steep, well drained or somewhat excessively drained soils

COMPILED 1985

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
FOREST SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION
TEXAS STATE SOIL AND WATER CONSERVATION BOARD

GENERAL SOIL MAP

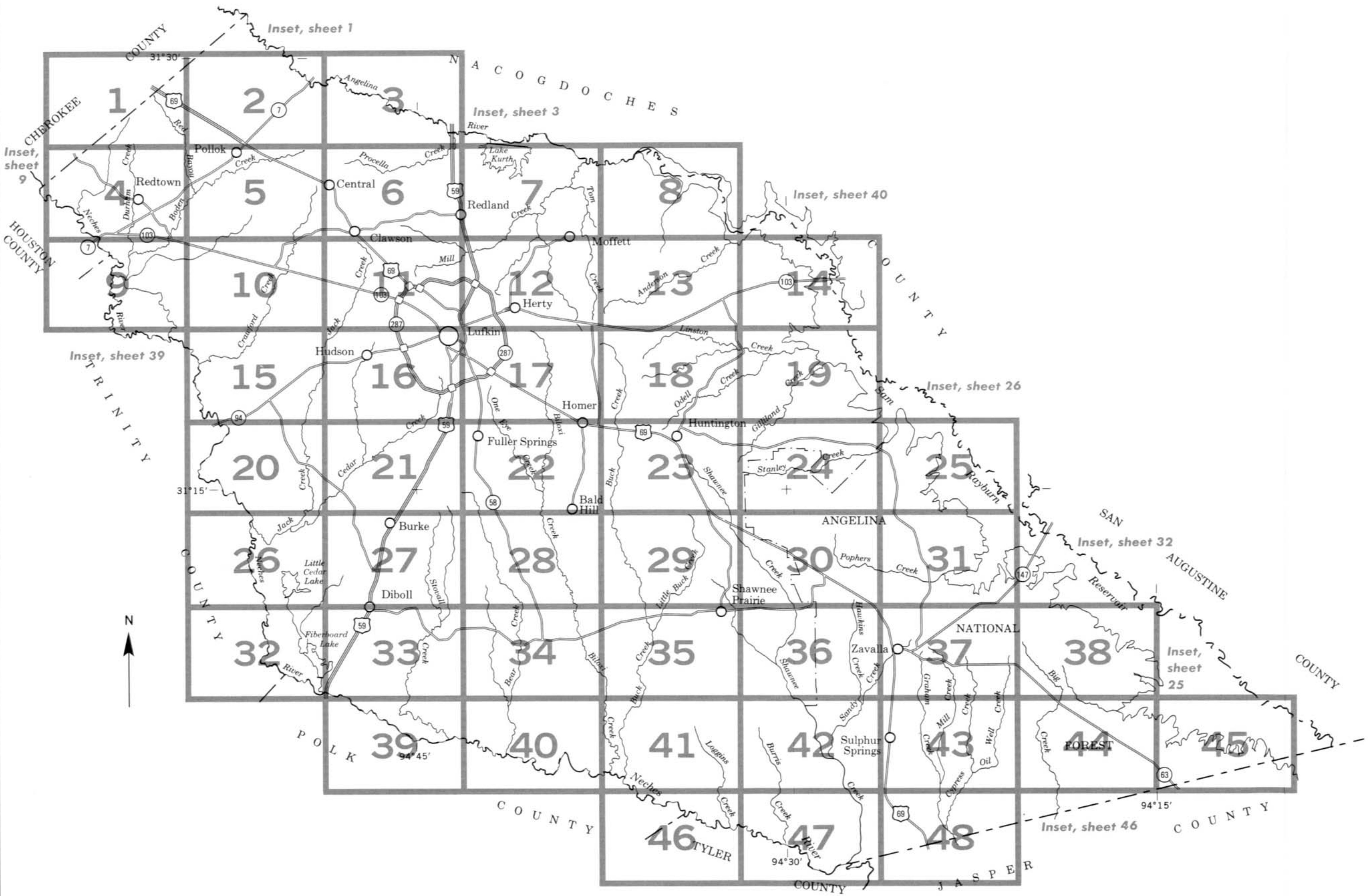
ANGELINA COUNTY, TEXAS

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS

ANGELINA COUNTY, TEXAS

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

SOIL LEGEND

The map symbols recommended for publication are alphabetic letters. The first letter of the map symbol, always a capital is the initial letter of the soil name. The second letter is a lower case letter. The third letter, if used, is a capital letter and denotes slope class. Symbols without a slope letter are for nearly level soils.

SYMBOL	NAME
AaB	Alazan very fine sandy loam, 0 to 4 percent slopes
Ab	Alazan-Besner complex, gently undulating
AcB	Alazan-Urban land complex, 0 to 4 percent slopes
AtB	Attoyac fine sandy loam, 0 to 4 percent slopes
AtD	Attoyac fine sandy loam, 8 to 15 percent slopes
BaB	Bernaldo fine sandy loam, 0 to 3 percent slopes
Bb	Bernaldo-Besner complex, gently undulating
BnB	Bienville loamy fine sand, 0 to 5 percent slopes
BrC	Browndell fine sandy loam, 2 to 5 percent slopes
BrD	Browndell fine sandy loam, 5 to 15 percent slopes
CoB	Corrigan fine sandy loam, 1 to 5 percent slopes
CtD	Cuthbert fine sandy loam, 5 to 15 percent slopes
CtF	Cuthbert fine sandy loam, 15 to 35 percent slopes
CuD	Cuthbert gravelly fine sandy loam, 8 to 15 percent slopes
DaC	Darco loamy fine sand, 1 to 8 percent slopes
DaD	Darco loamy fine sand, 8 to 15 percent slopes
DbA	Diboll very fine sandy loam, 0 to 1 percent slopes
DbB	Diboll very fine sandy loam, 1 to 4 percent slopes
Du	Dumps
EtB	Etoile loam, 1 to 5 percent slopes
FfA	Fuller fine sandy loam, 0 to 1 percent slopes
FfB	Fuller fine sandy loam, 1 to 4 percent slopes
FuB	Fuller-Urban land complex, 1 to 4 percent slopes
HeA	Herty very fine sandy loam, 0 to 1 percent slopes
HeB	Herty very fine sandy loam, 1 to 5 percent slopes
HuB	Herty-Urban land complex, 1 to 5 percent slopes
Iu	Iuka fine sandy loam, occasionally flooded
KaB	Keithville very fine sandy loam, 0 to 3 percent slopes
Kb	Keithville-Sawtown complex, gently undulating
KcB	Keltys fine sandy loam, 1 to 5 percent slopes
KcD	Keltys fine sandy loam, 5 to 15 percent slopes
KdB	Keltys-Urban land complex, 1 to 5 percent slopes
KdD	Keltys-Urban land complex, 5 to 15 percent slopes
KfB	Kirvin fine sandy loam, 1 to 5 percent slopes
KgB	Kirvin gravelly fine sandy loam, 1 to 5 percent slopes
KhB	Kirvin soils, graded, 2 to 5 percent slopes
KmD	Kisatchie fine sandy loam, 5 to 15 percent slopes
Ko	Koury loam, occasionally flooded
Kp	Koury loam, frequently flooded
Ks	Koury-Urban land complex, occasionally flooded
KuB	Kurth fine sandy loam, 0 to 4 percent slopes
KwB	Kurth-Urban land complex, 0 to 4 percent slopes
LaB	Lacerda clay loam, 0 to 4 percent slopes
LeC	Letney loamy sand, 1 to 8 percent slopes
LtB	Lilbert loamy fine sand, 1 to 5 percent slopes
Ma	Mantachie clay loam, frequently flooded
Me	Marietta fine sandy loam, occasionally flooded
Mf	Marietta fine sandy loam, frequently flooded
MhB	Melhomes loamy sand, frequently flooded
MoA	Mollville loam, 0 to 1 percent slopes
Mp	Mollville-Besner complex, gently undulating
MsB	Moswell loam, 1 to 5 percent slopes
MsD	Moswell loam, 5 to 15 percent slopes
MuB	Moswell-Urban land complex, 1 to 5 percent slopes
Mx	Moten-Multey complex, gently undulating
NaD	Naclina clay, 5 to 15 percent slopes
Oz	Ozias silty clay, frequently flooded
Pa	Pits
Po	Pophers silty clay loam, frequently flooded
RaB	Rayburn fine sandy loam, 1 to 5 percent slopes
RaD	Rayburn fine sandy loam, 5 to 15 percent slopes
RkB	Raylake clay loam, 0 to 4 percent slopes
RnB	Rentzel loamy fine sand, 0 to 4 percent slopes
RoB	Rosenwall fine sandy loam, 1 to 5 percent slopes
RoD	Rosenwall fine sandy loam, 5 to 15 percent slopes
SaB	Sacul fine sandy loam, 1 to 5 percent slopes
SaD	Sacul fine sandy loam, 5 to 15 percent slopes
SbB	Sacul-Urban land complex, 1 to 5 percent slopes
StD	Stringtown fine sandy loam, 5 to 15 percent slopes
StF	Stringtown fine sandy loam, 15 to 35 percent slopes
TeD	Tehran loamy sand, 8 to 15 percent slopes
TnD	Tenaha loamy fine sand, 5 to 15 percent slopes
WoB	Woodtell very fine sandy loam, 1 to 5 percent slopes
WoD	Woodtell very fine sandy loam, 5 to 15 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label) — Hedley Airstrip

- Small airport, airfield, park, oilfield, cemetery, or flood pool — FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 21
- Federal — 173
- State — 28
- County, farm or ranch — 1283

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water, w

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water, w
- Intermittent — int, i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — AtD, SaB

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

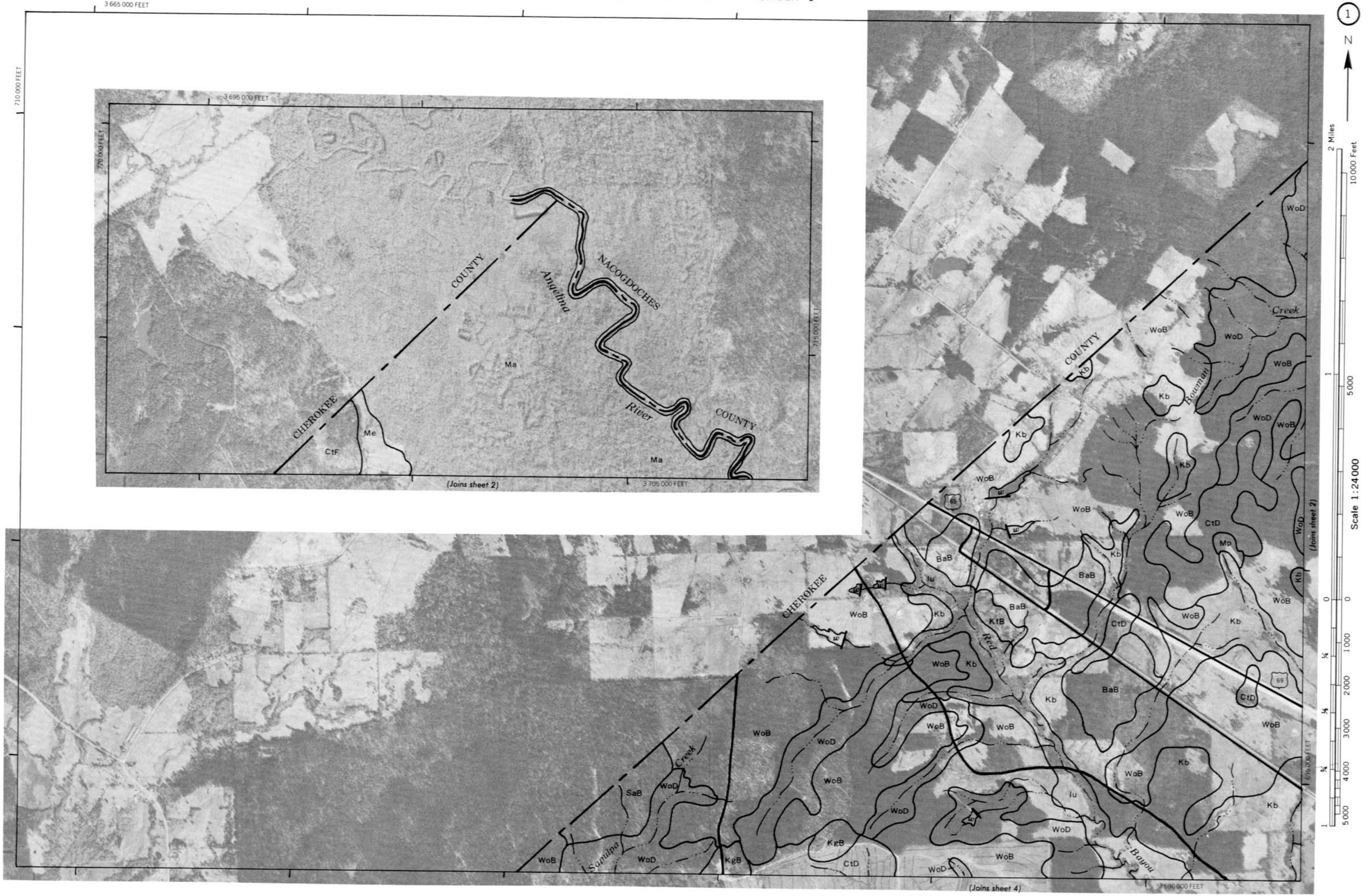
GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) — S

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot



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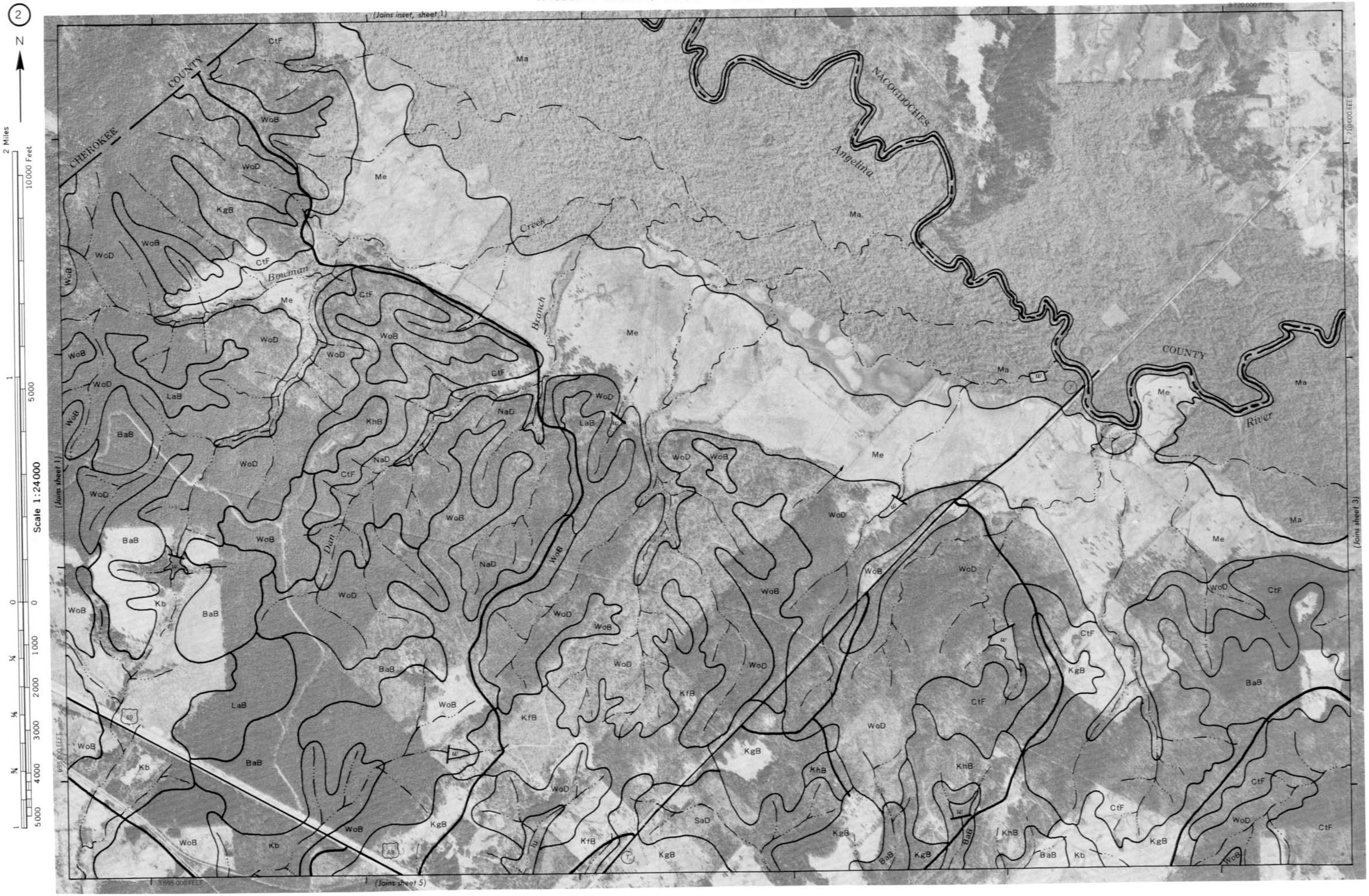

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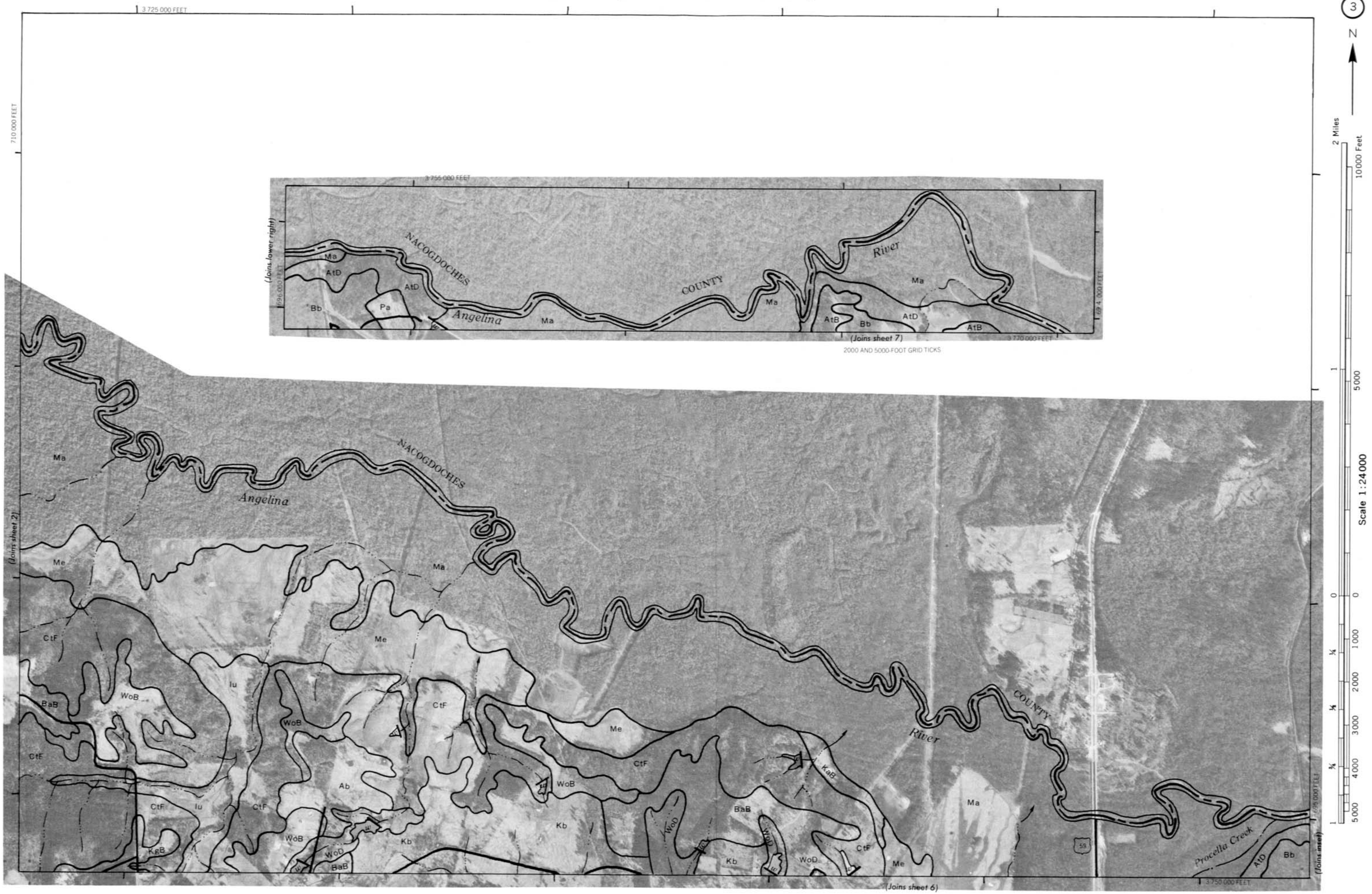

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ANGELINA COUNTY, TEXAS — SHEET NUMBER 5

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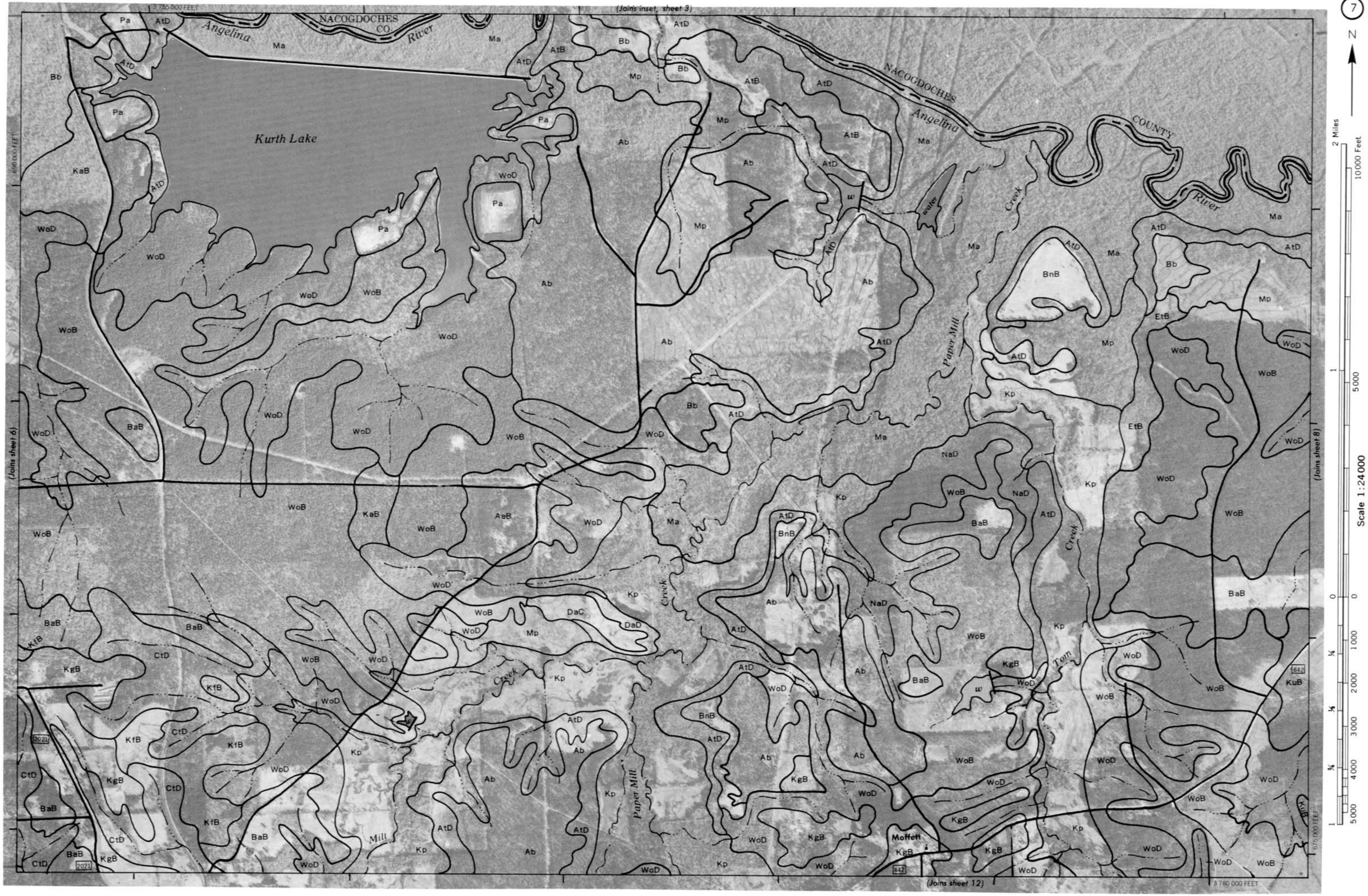

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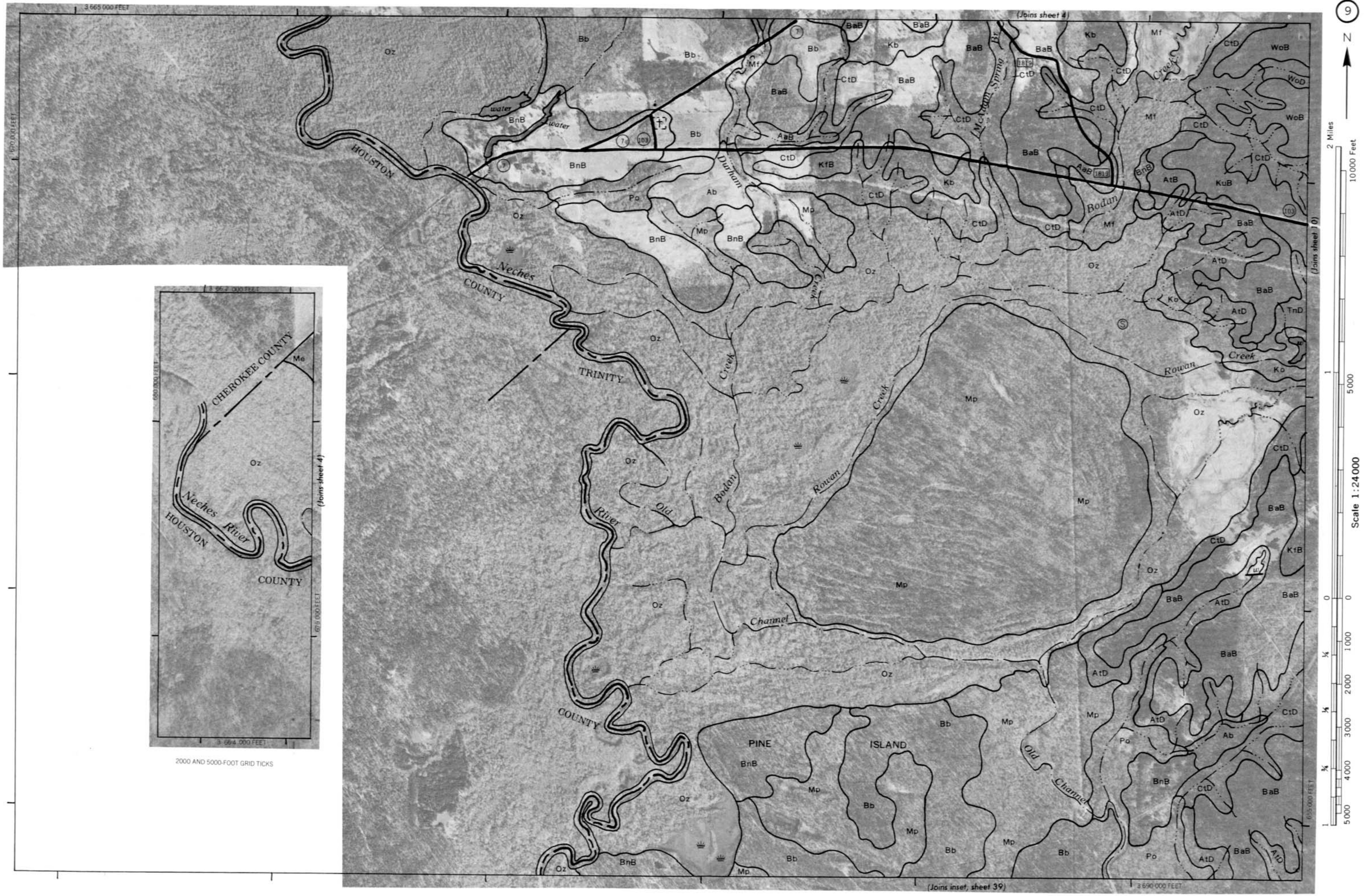
9
3 665 000 FEET
(Joins sheet 4)
(Joins sheet 10)
(Joins inset, sheet 39)
3 690 000 FEET
HOUSTON
COUNTY
TRINITY
Neches
River
COUNTY
Durham
Creek
Bodan
Creek
Rowan
Creek
Old
Channel
McMann Spring Br.
PINE
ISLAND
water
CHEROKEE COUNTY
Neches
River
HOUSTON
COUNTY
(Joins sheet 4)
Oz
Me
Mp
Bb
BaB
BnB
CtD
AtD
Ab
Po
N
2 Miles
10000 Feet
Scale 1:24000
2000 AND 5000-FOOT GRID TICKS

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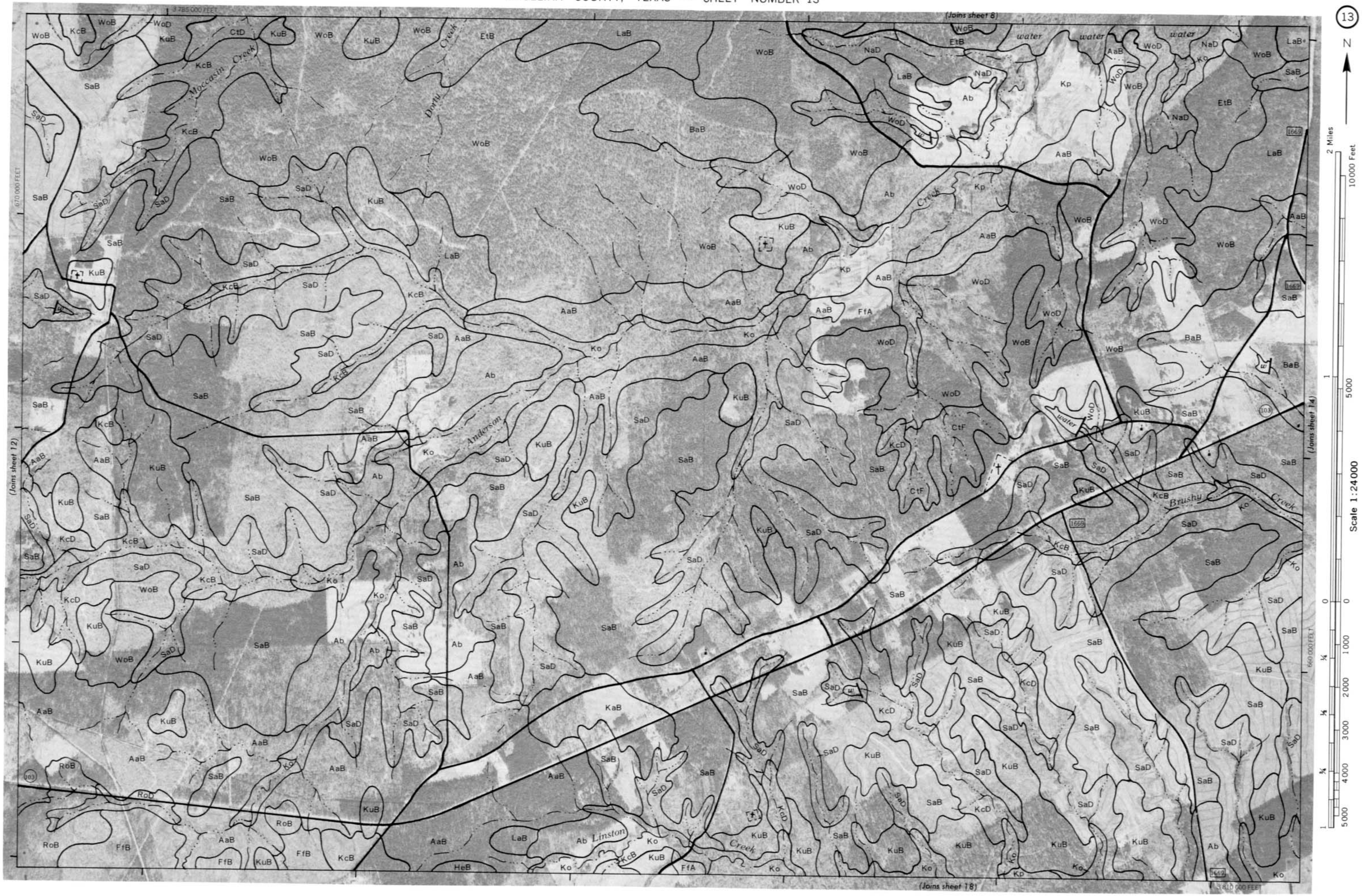

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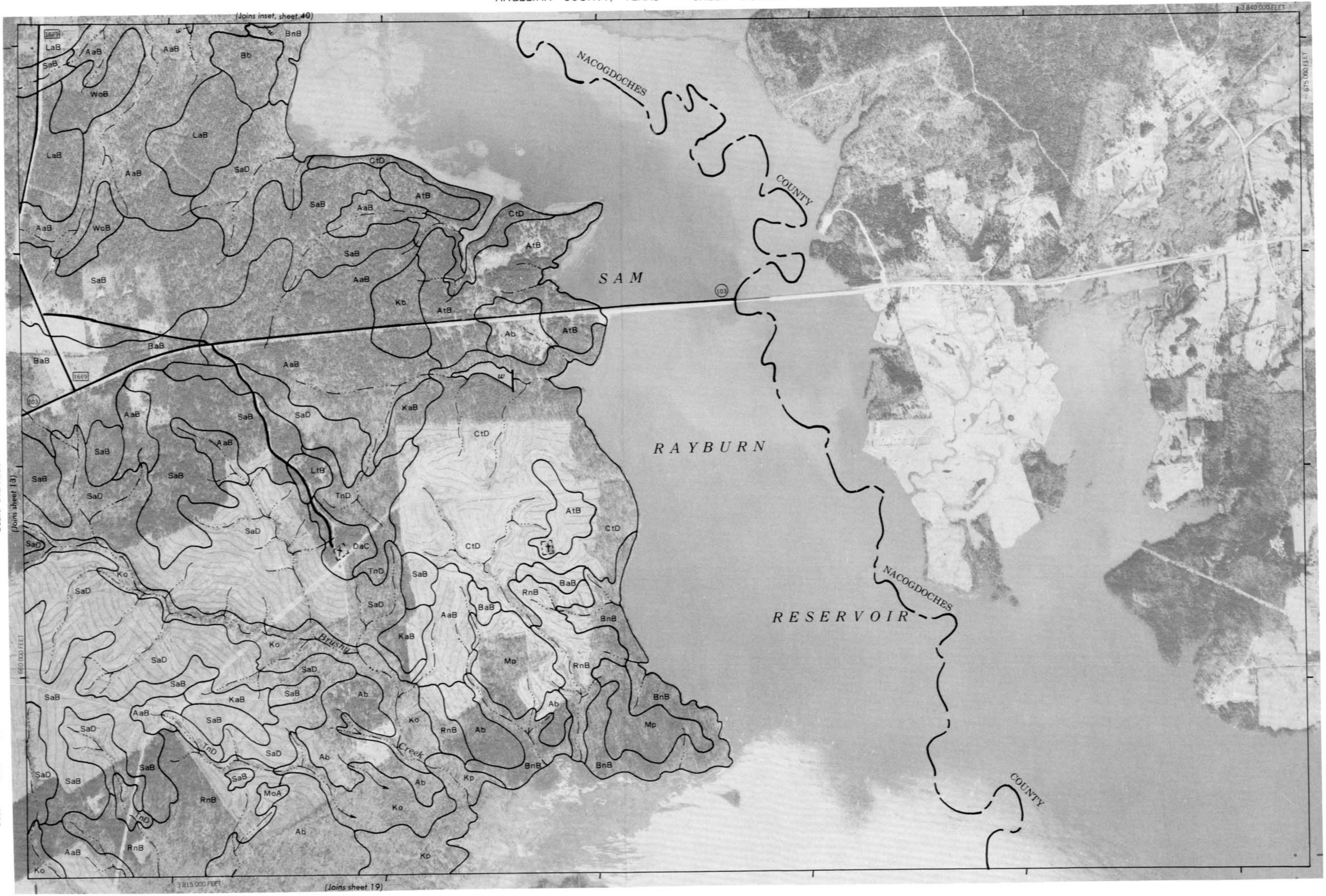

Scale 1:24 000

2 Miles
1
0
¼
½
¾

10 000 Feet
5000
0
1000
2000
3000
4000
5000

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N

Scale 1:24 000

2 Miles

1

0

10 000 Feet

5000

0

1000

2000

3000

4000

5000

N

Scale 1:24000

2 Miles

10000 Feet

5000

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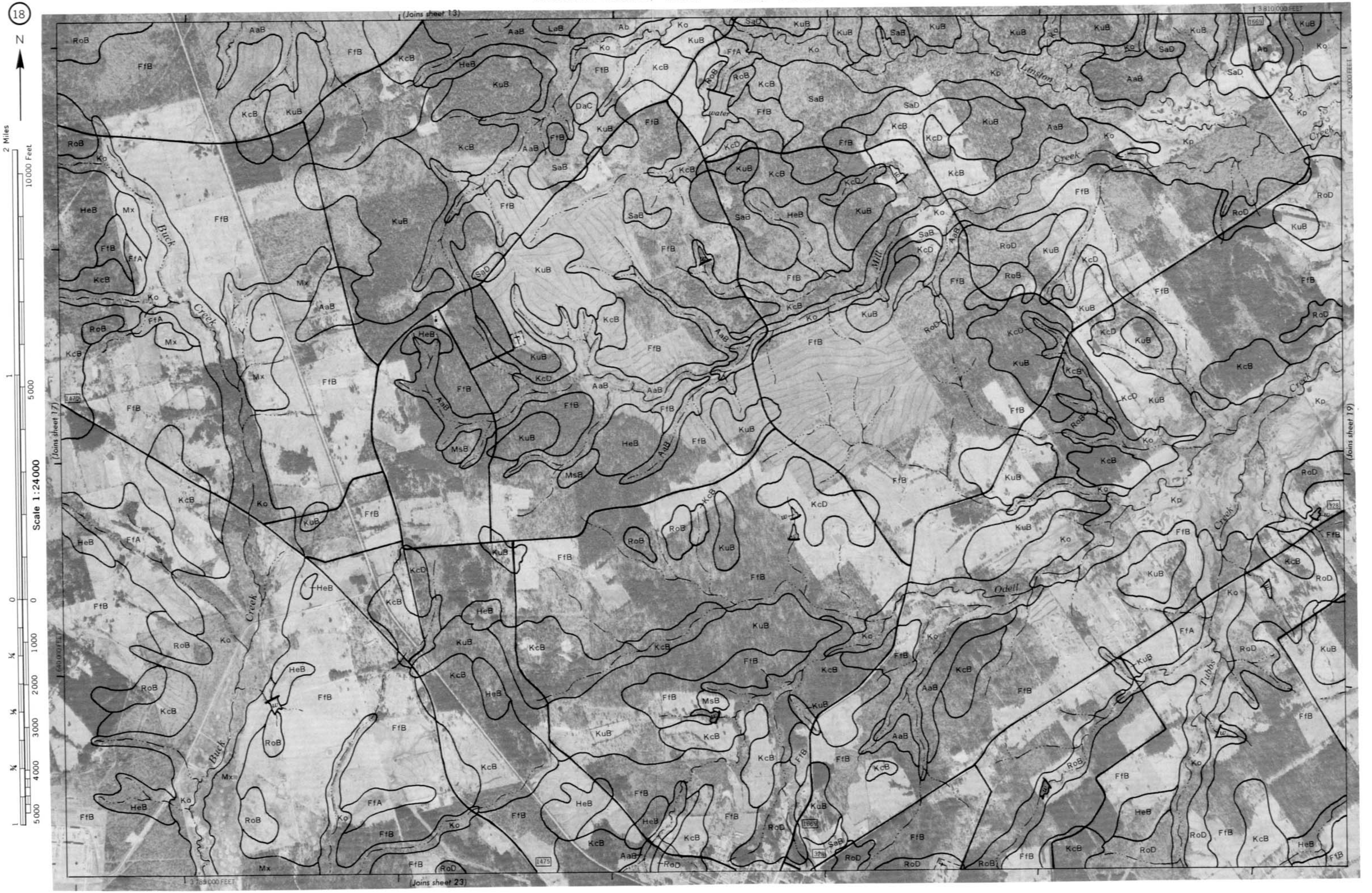

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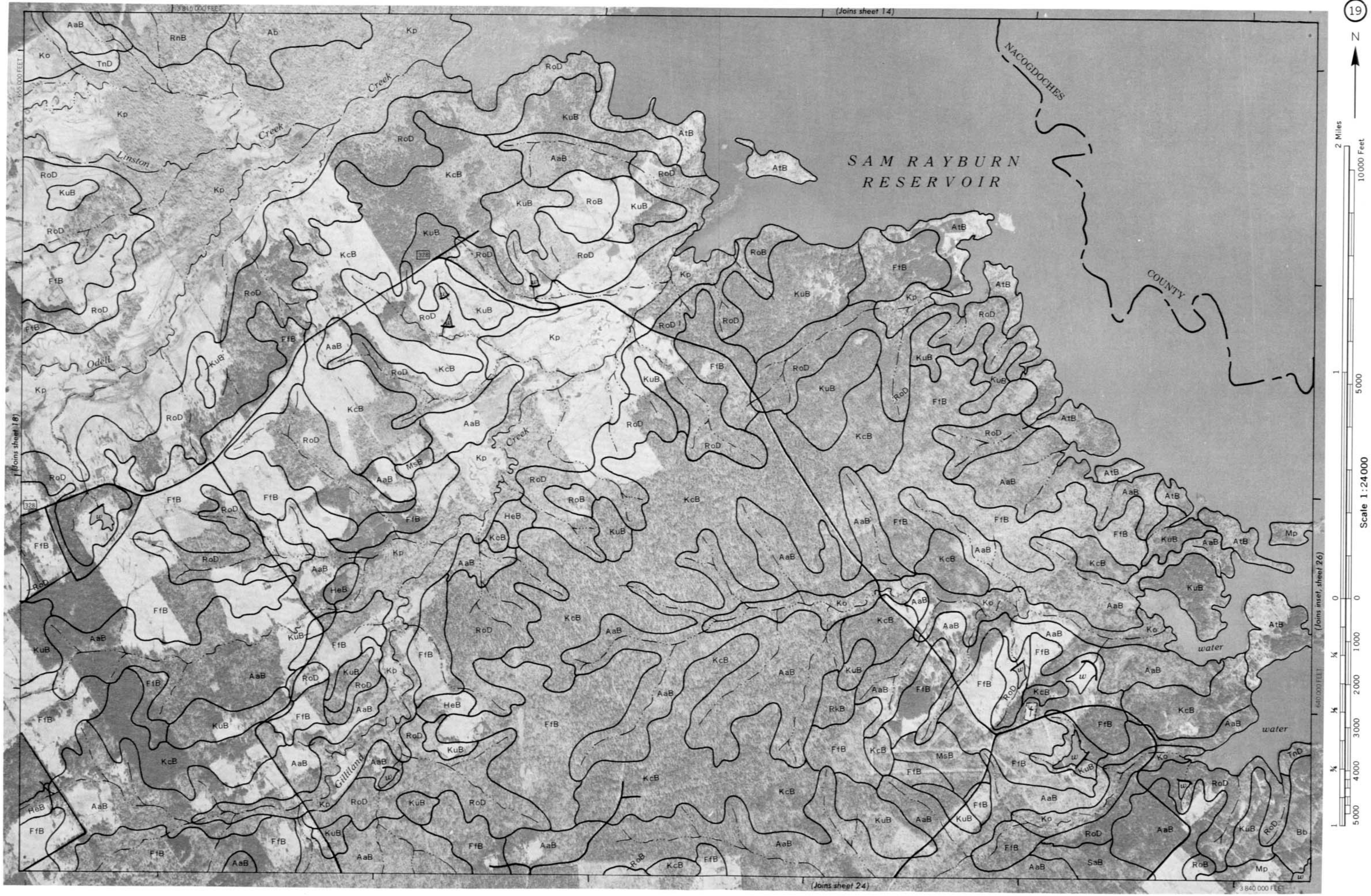

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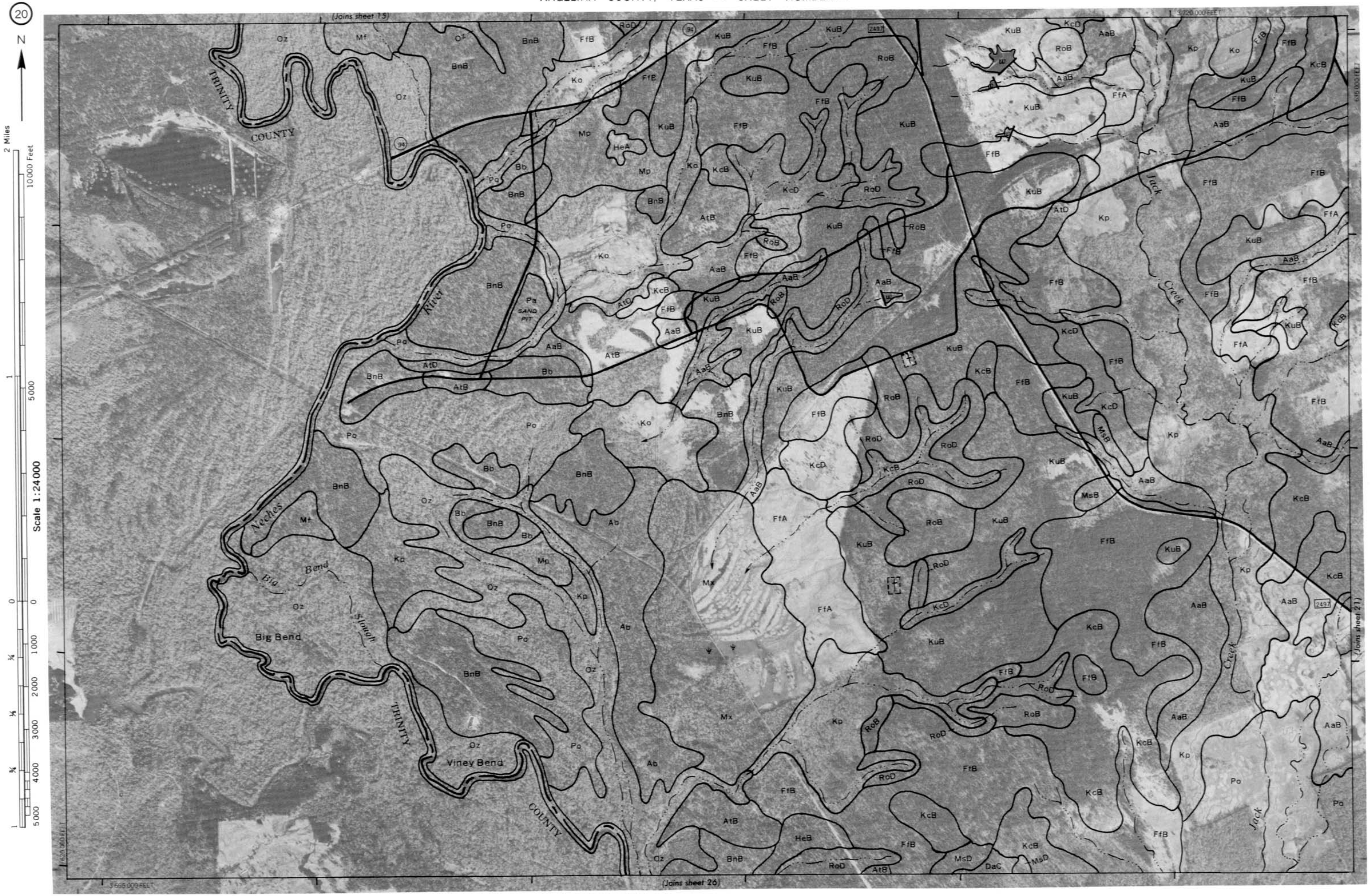

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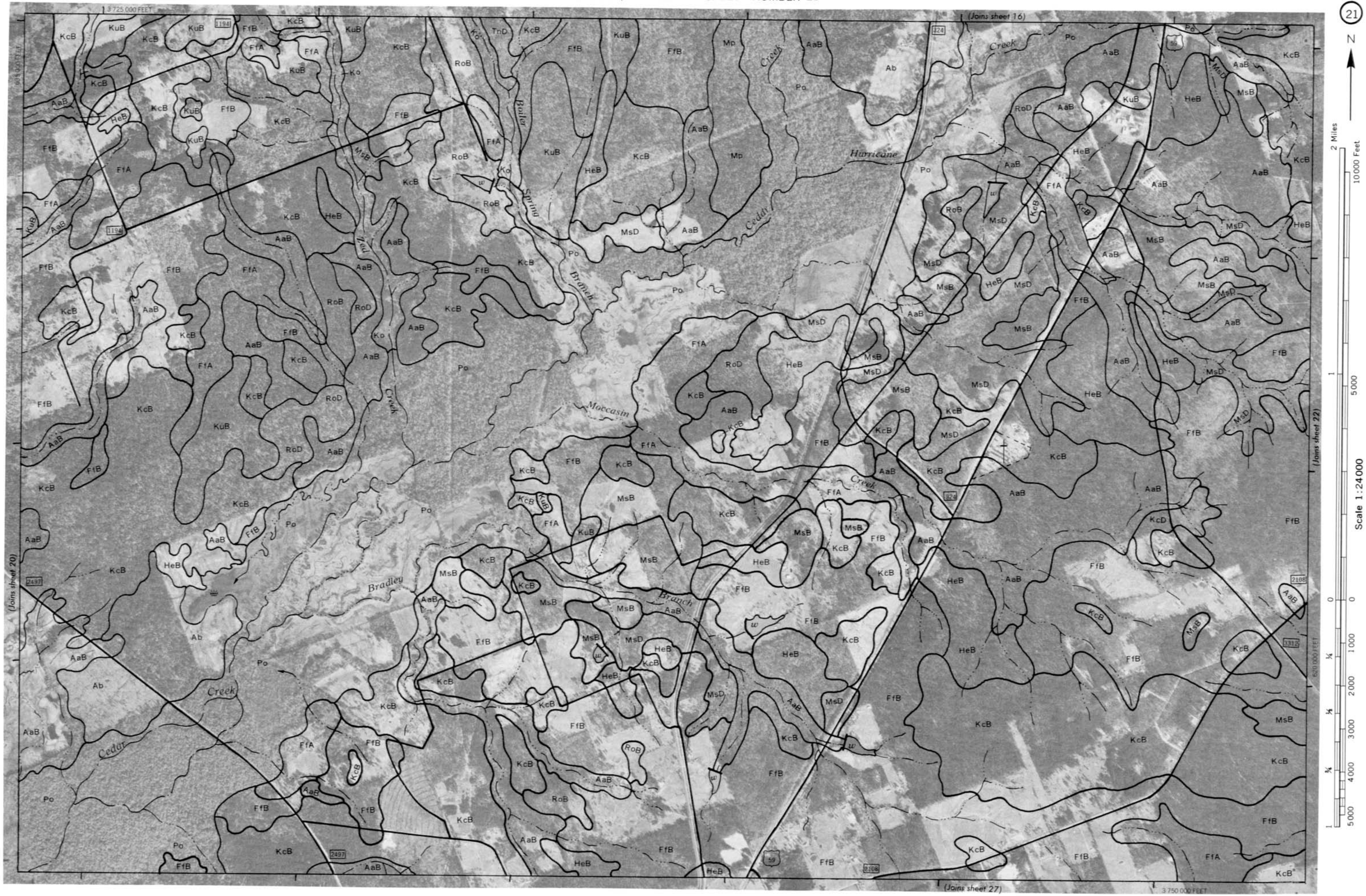
21
N
(Joins sheet 16)
(Joins sheet 20)
(Joins sheet 22)
(Joins sheet 27)
3 725 000 FEET
3 750 000 FEET
Boiler
Spring
Branch
Ceddy
Creek
Hurricane
Moccasin
Creek
Bradley
Branch
Cedar
Creek
2 Miles
10000 Feet
Scale 1:24000
1194
124
59
324
2497
2108
3312

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ANGELINA COUNTY, TEXAS — SHEET NUMBER 23

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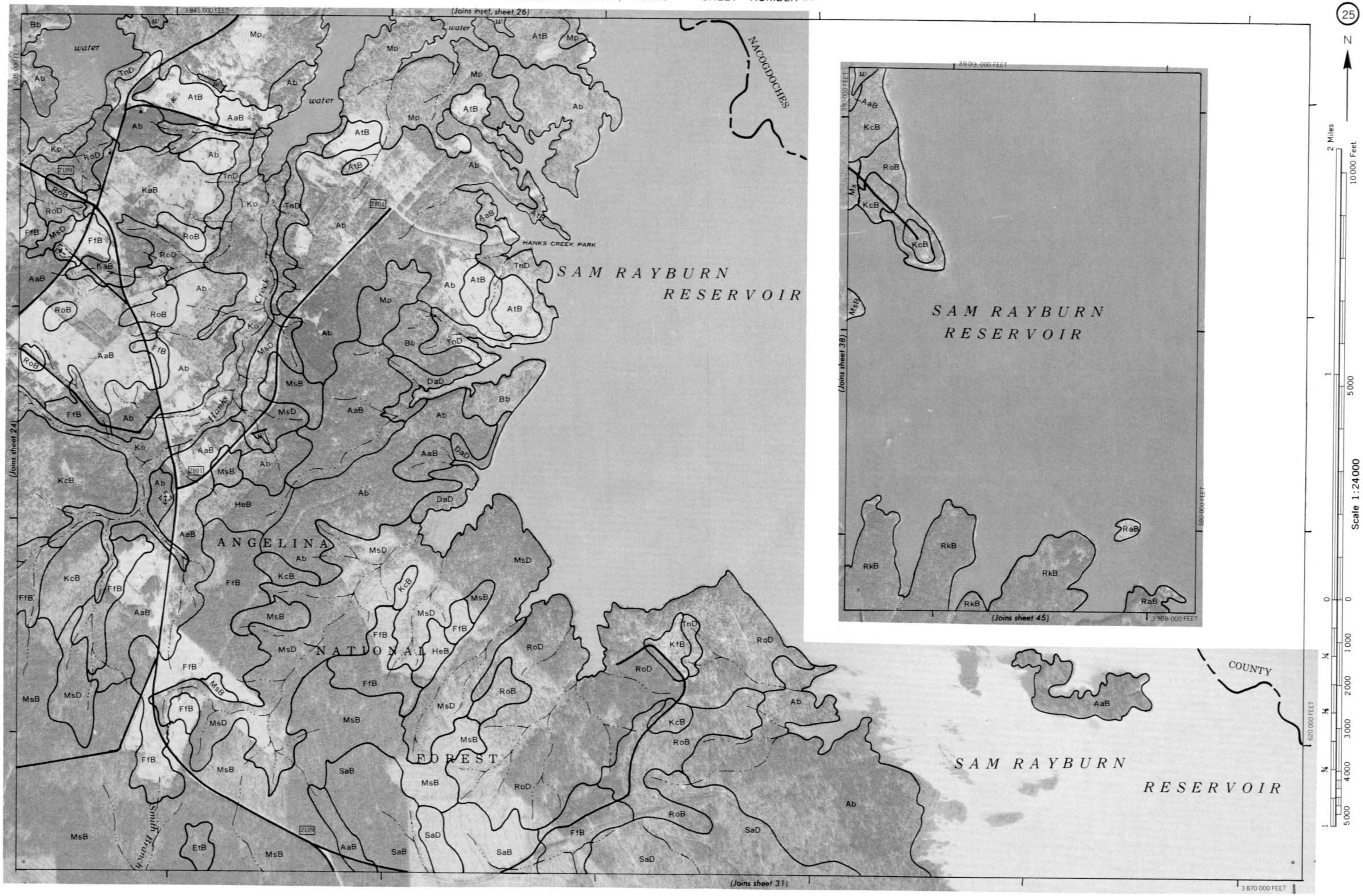

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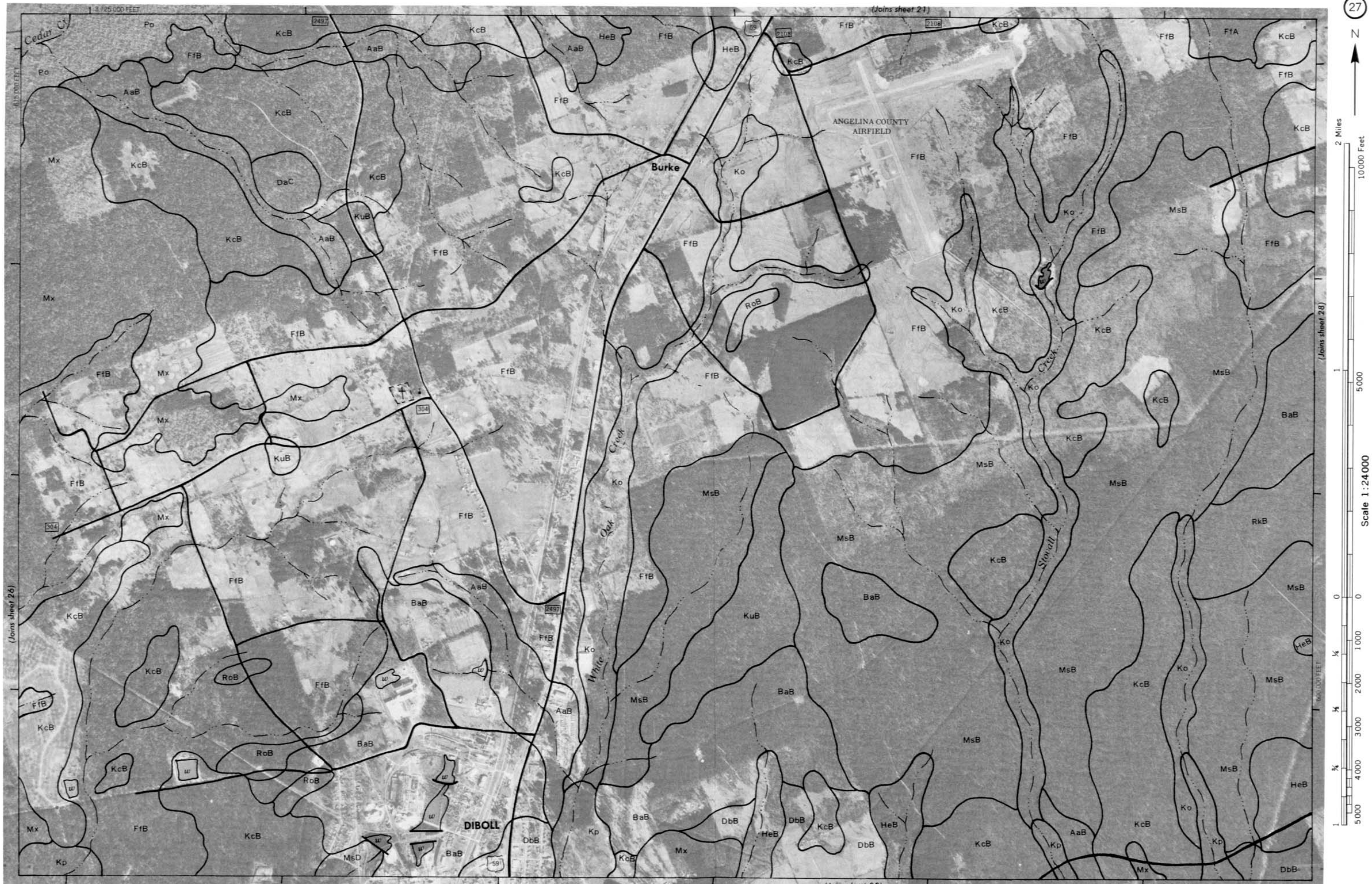

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ANGELINA COUNTY, TEXAS — SHEET NUMBER 29

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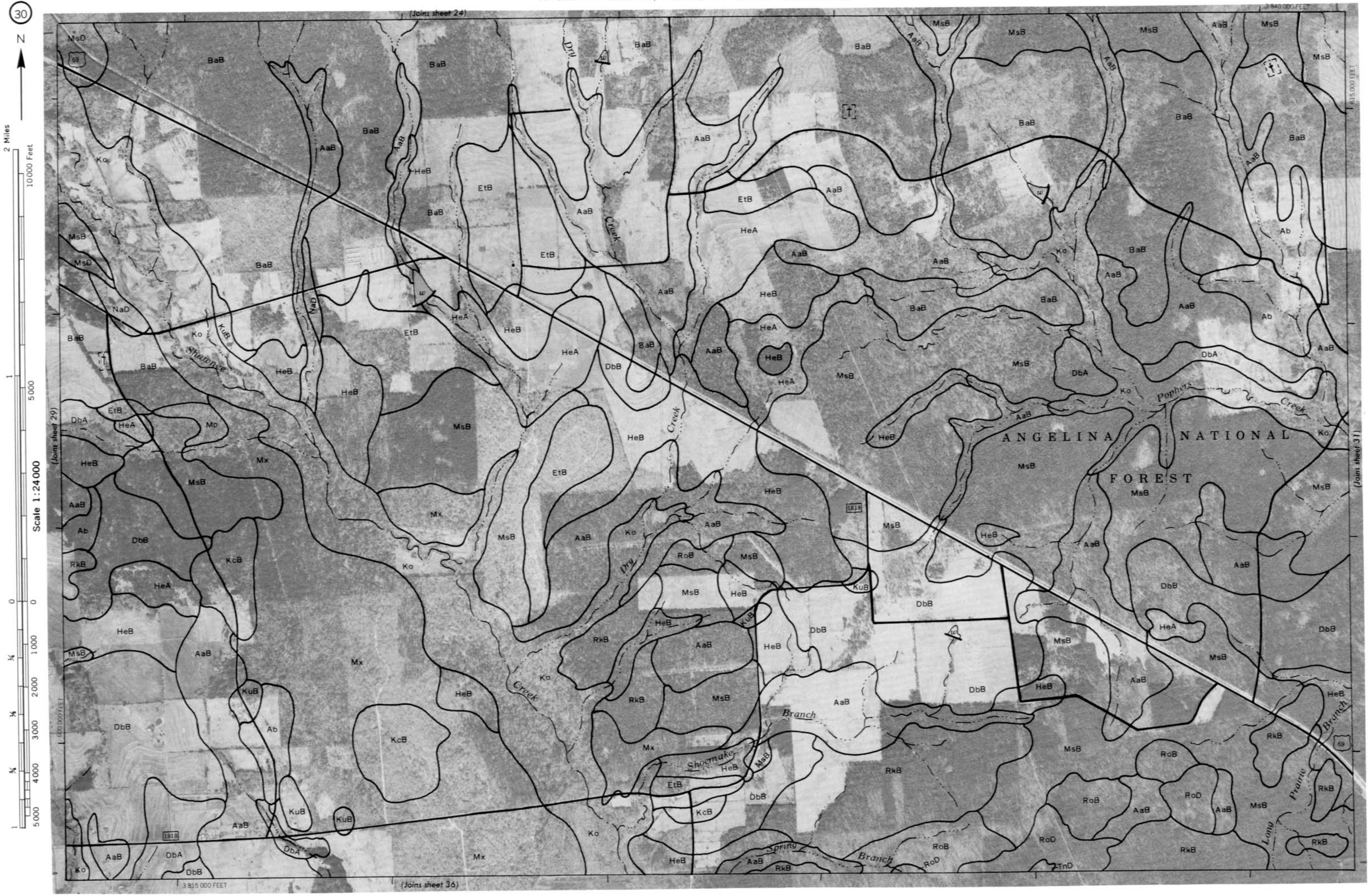

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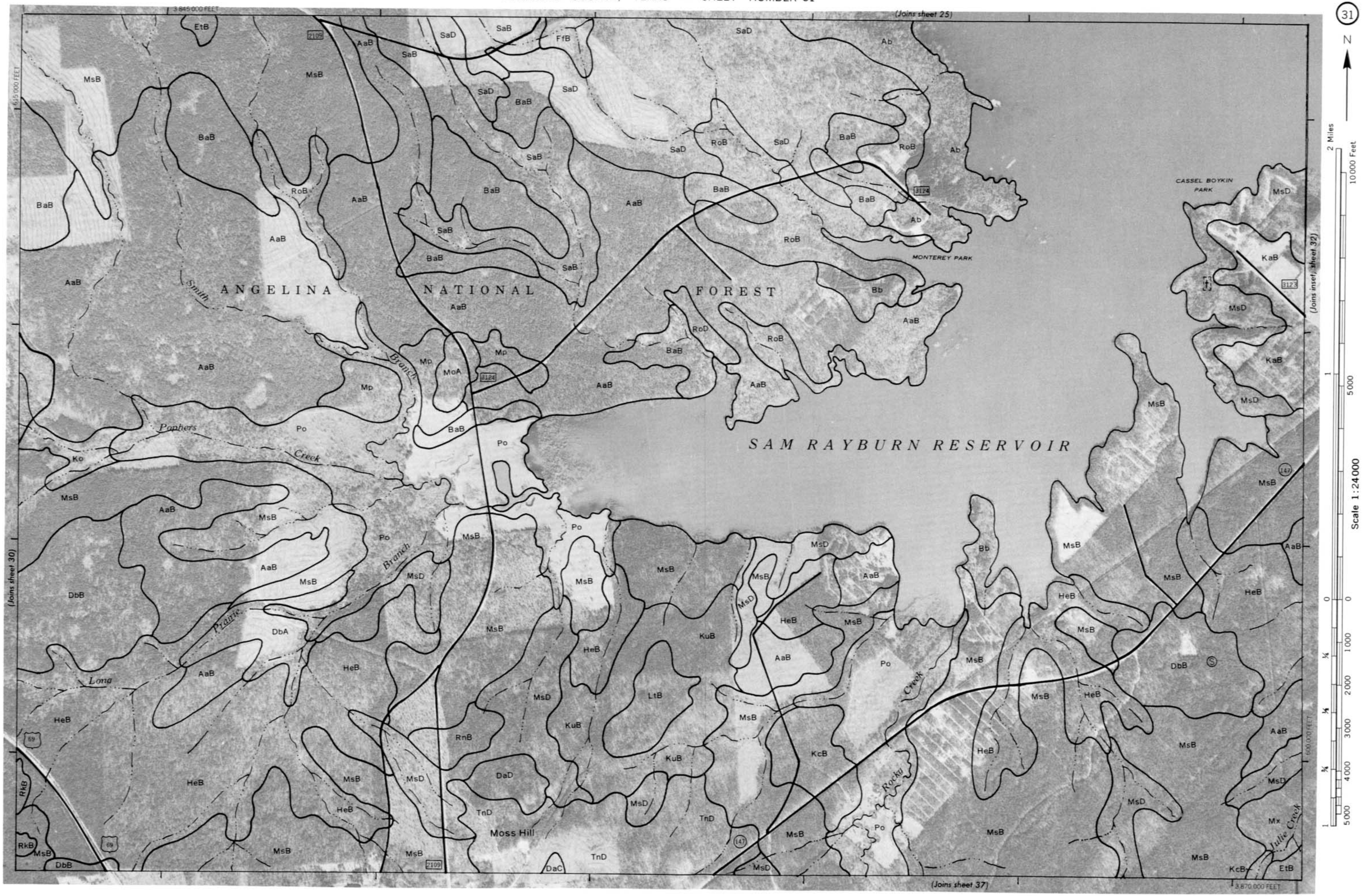

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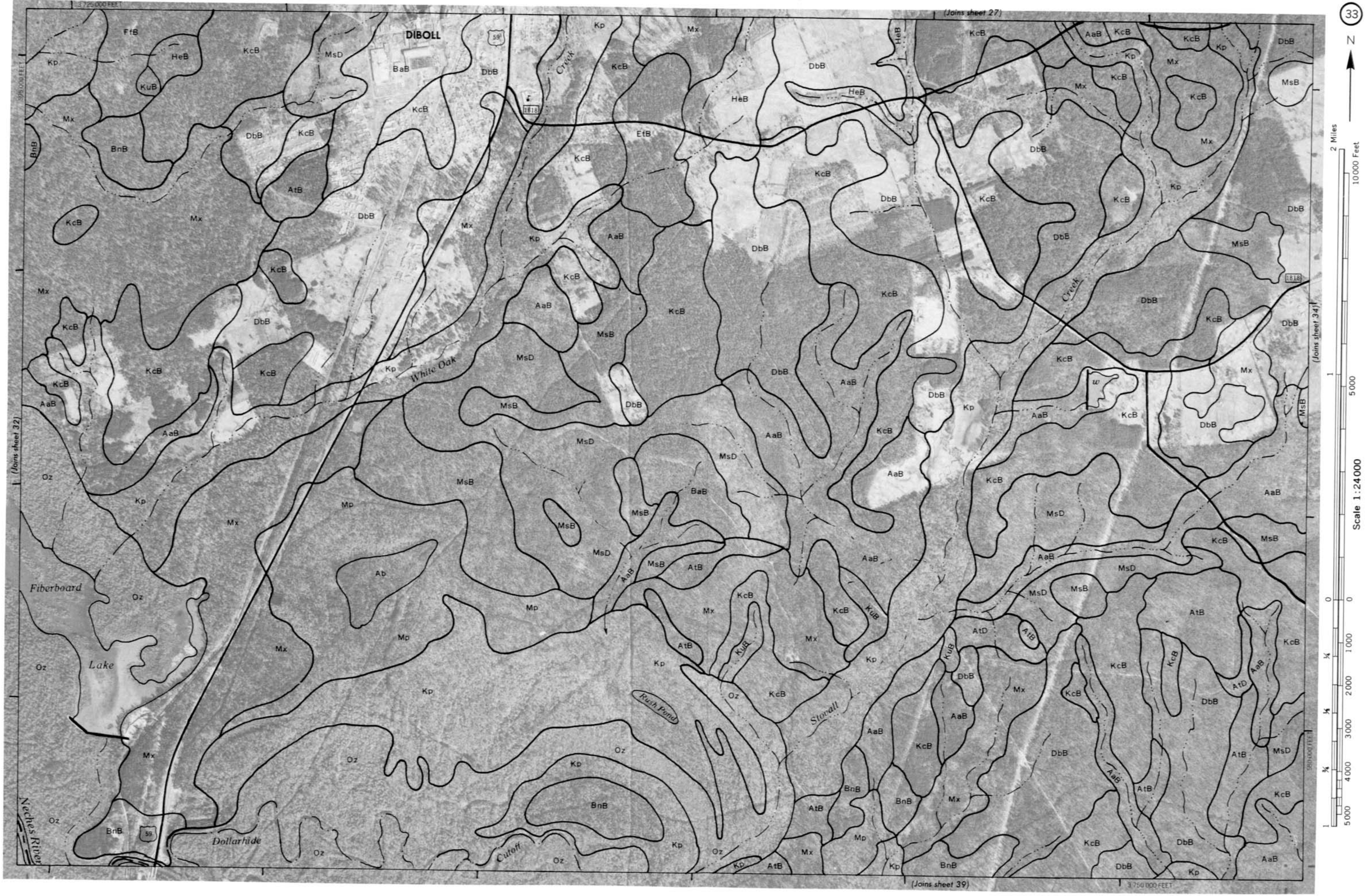
33
N
(Joins sheet 27)
(Joins sheet 32)
(Joins sheet 34)
(Joins sheet 39)
3 725 000 FEET
3 750 000 FEET
DIBOLL
59
1818
White Oak
Creek
Fiberboard
Lake
Neches River
Dollarhide
Cutoff
Rush Pond
Stovall
Scale 1:24 000
2 Miles
10 000 Feet
5000
1000
2000
3000
4000
FfB
HeB
KuB
KcB
MsD
BaB
DbB
Kp
Mx
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AtB
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w
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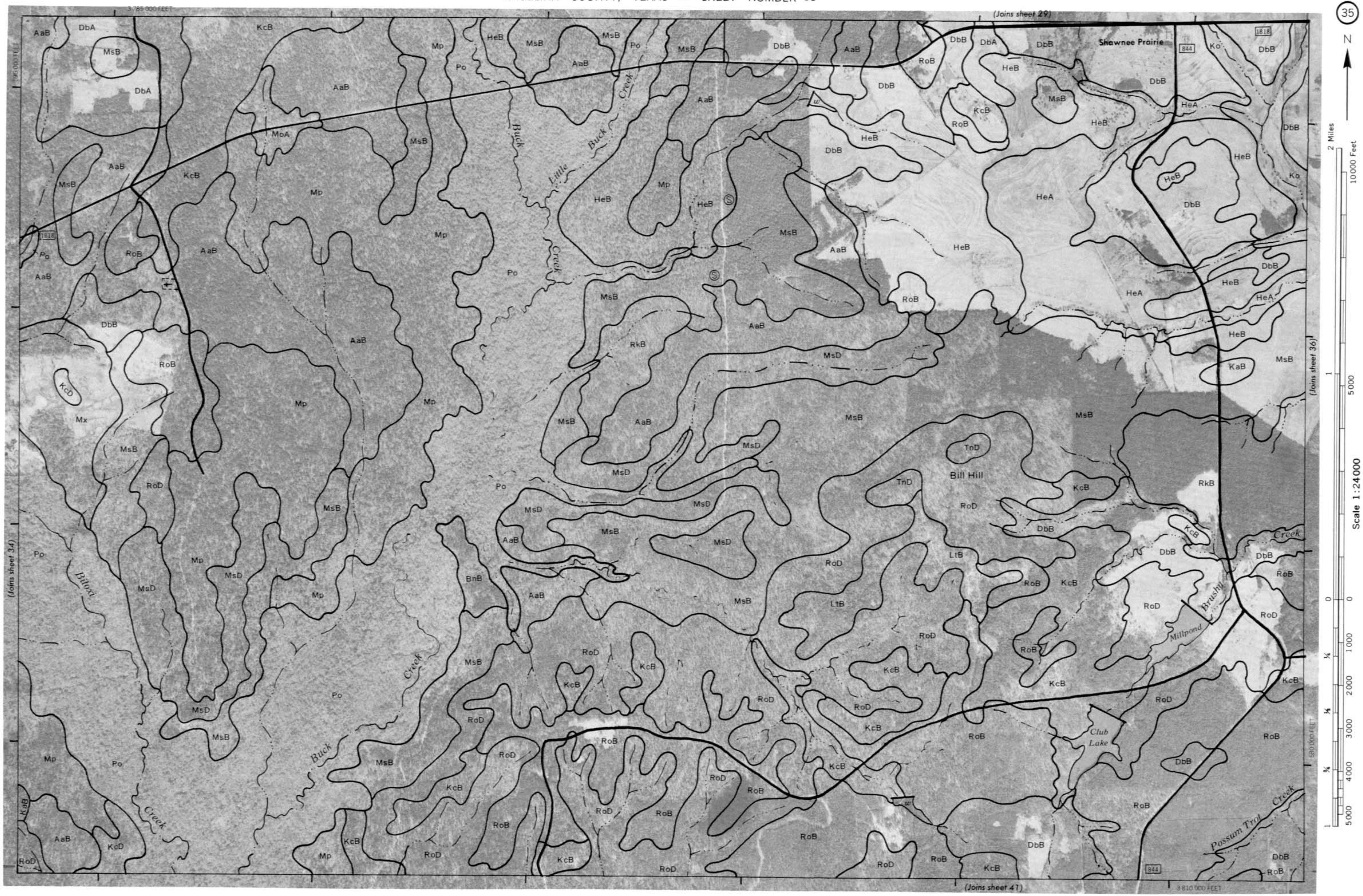

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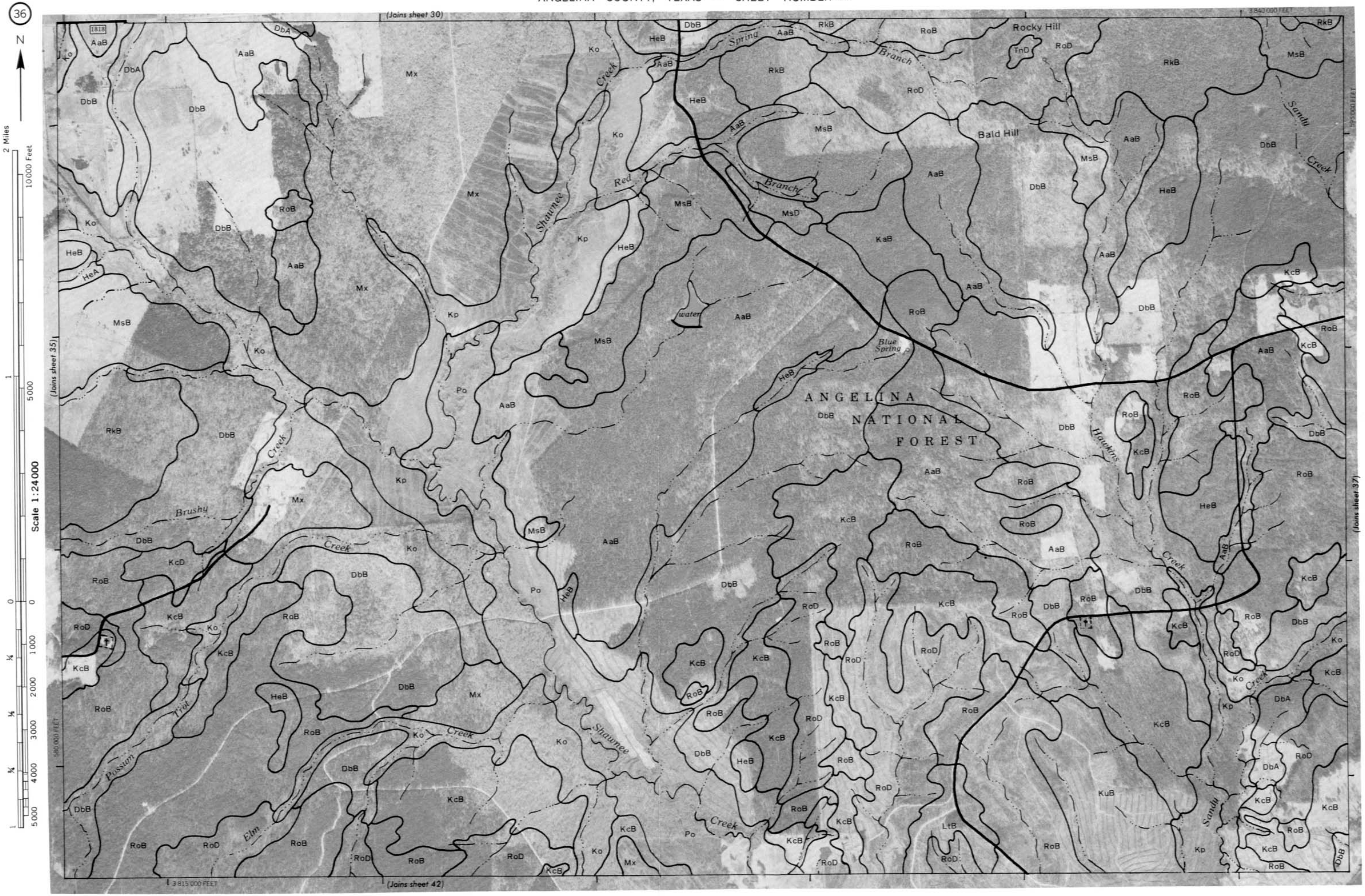

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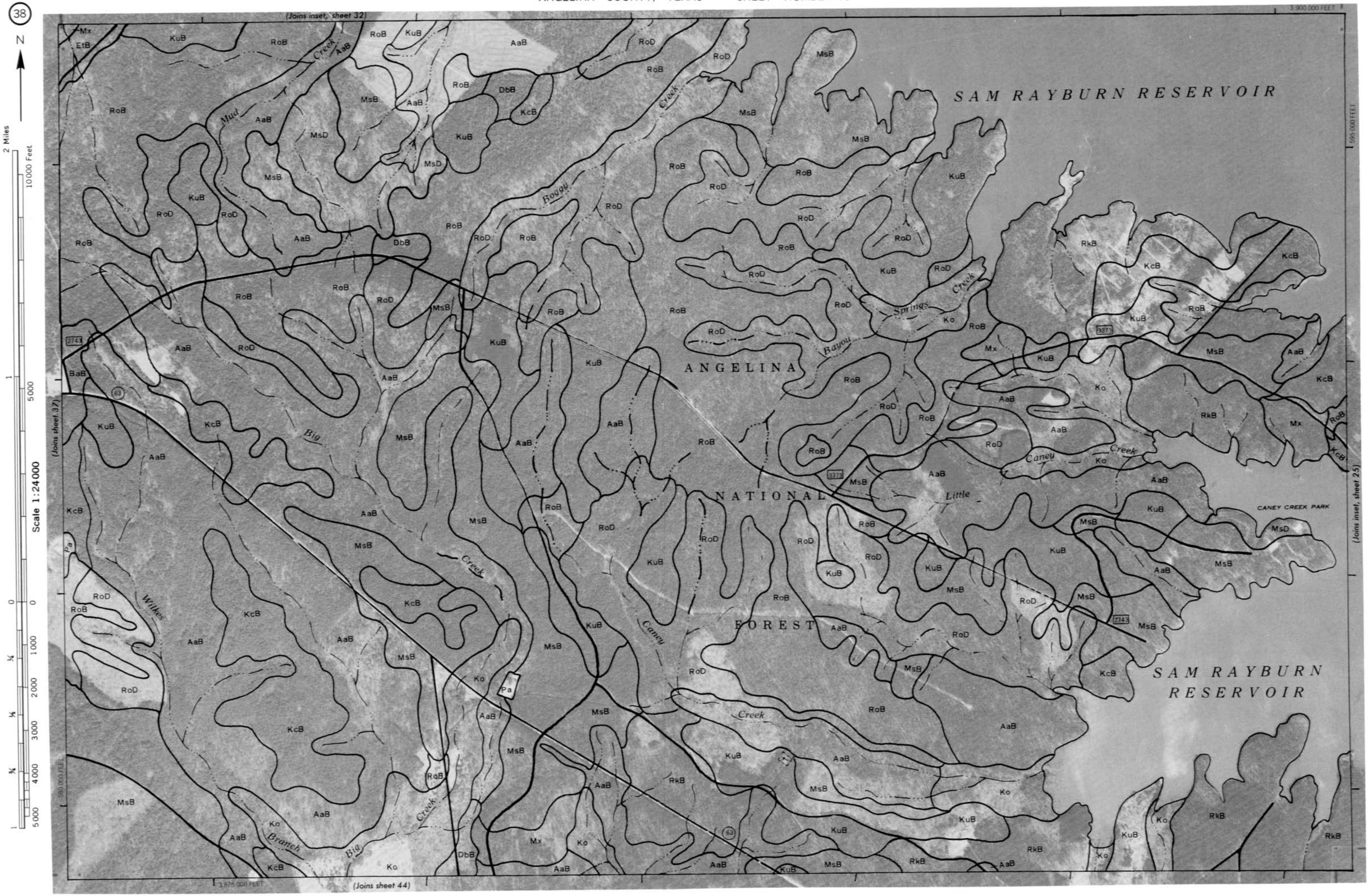

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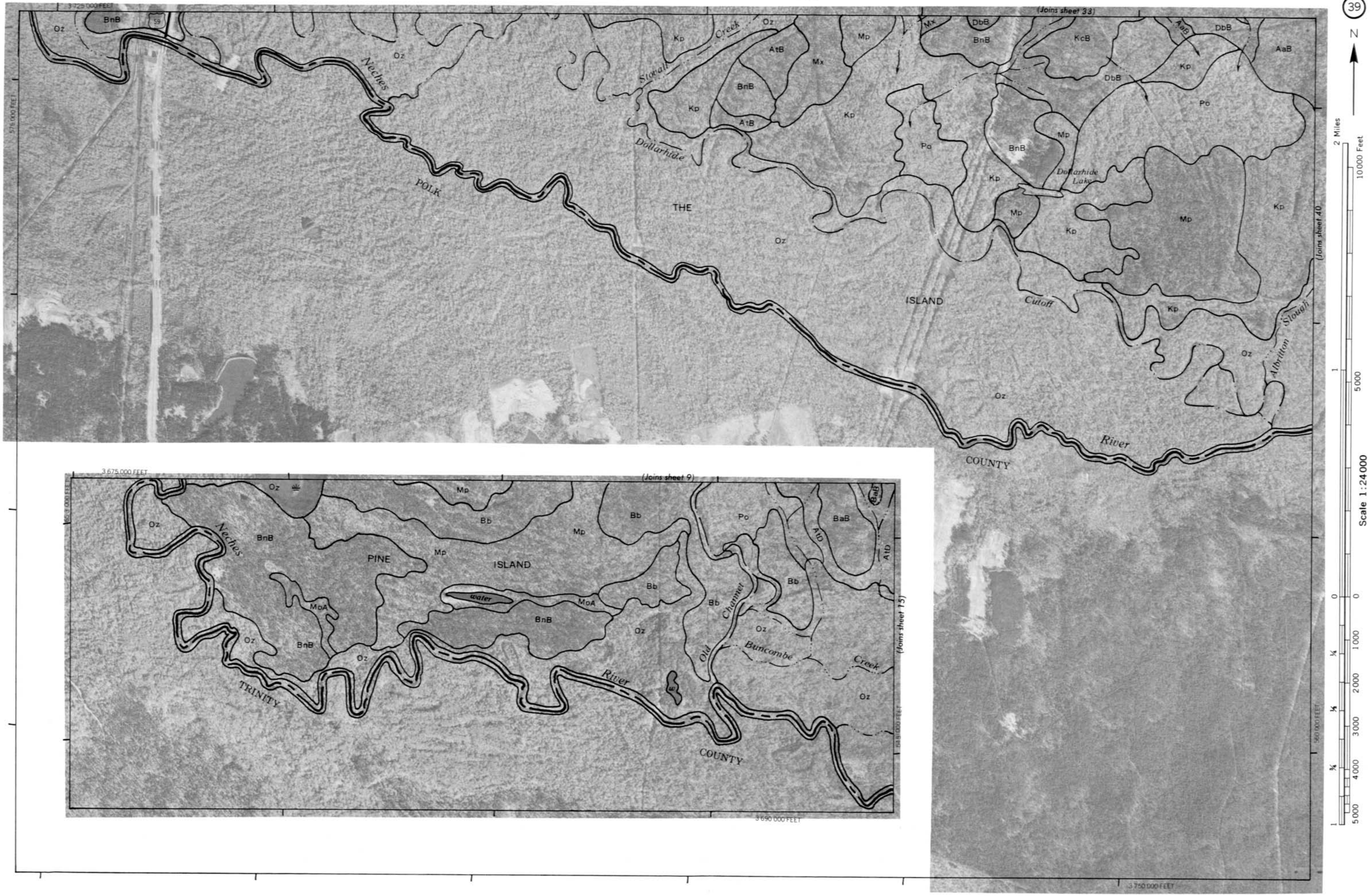

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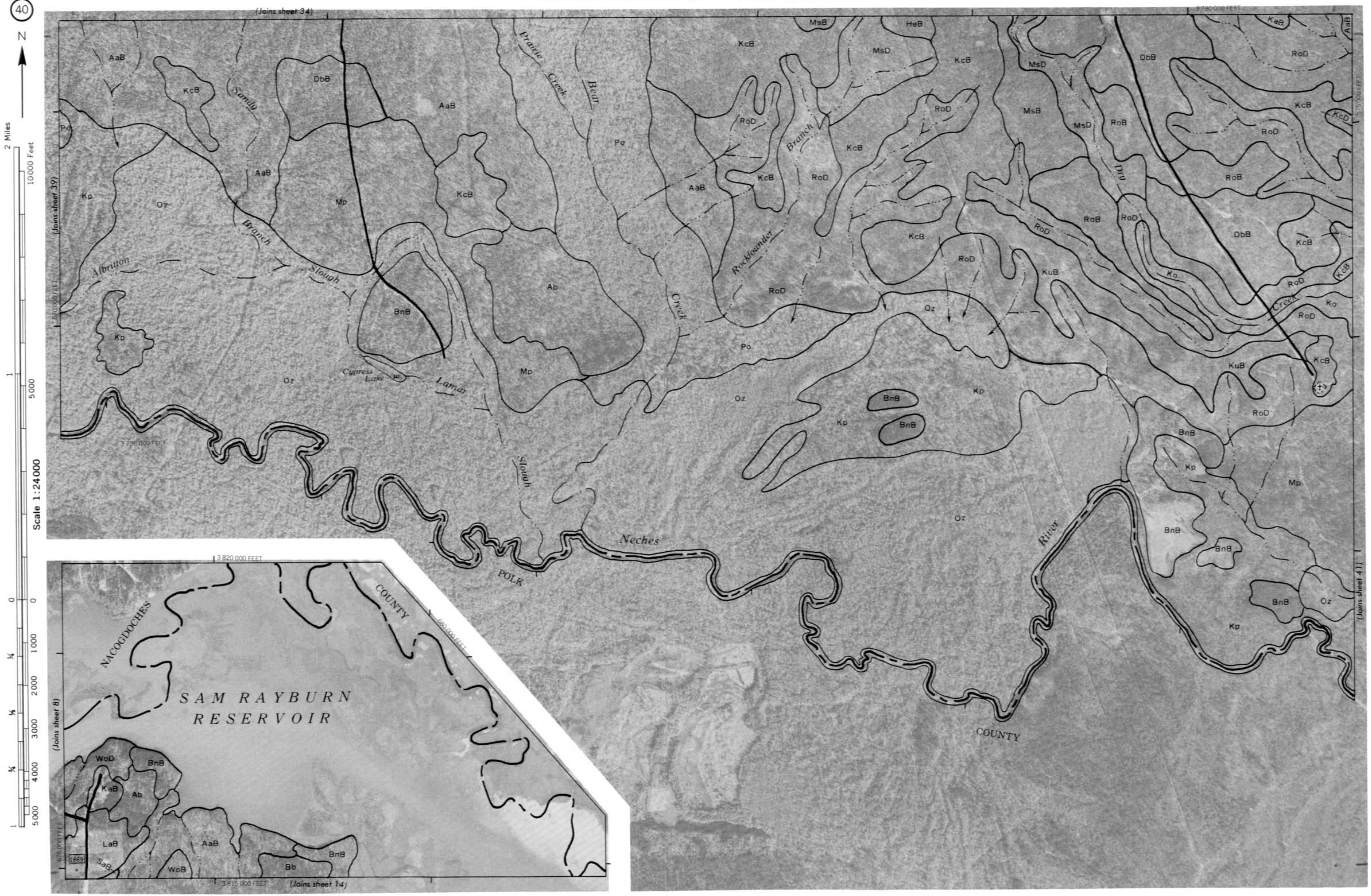

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42

N

2 Miles

1

0

¾

½

¼

Scale 1:24 000

10 000 Feet

5000

0

1000

2000

3000

4000

5000

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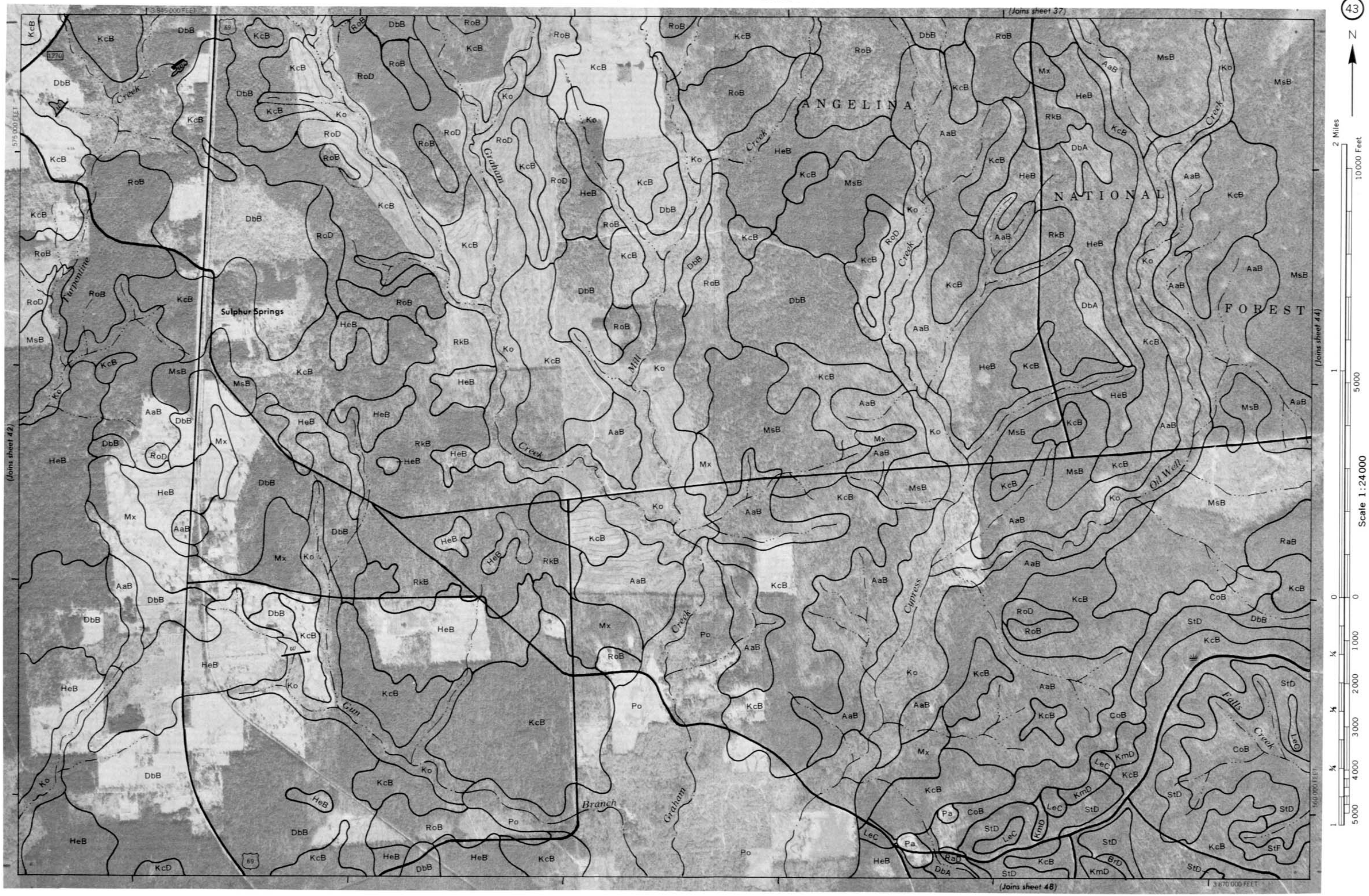

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ANGELINA COUNTY, TEXAS — SHEET NUMBER 45

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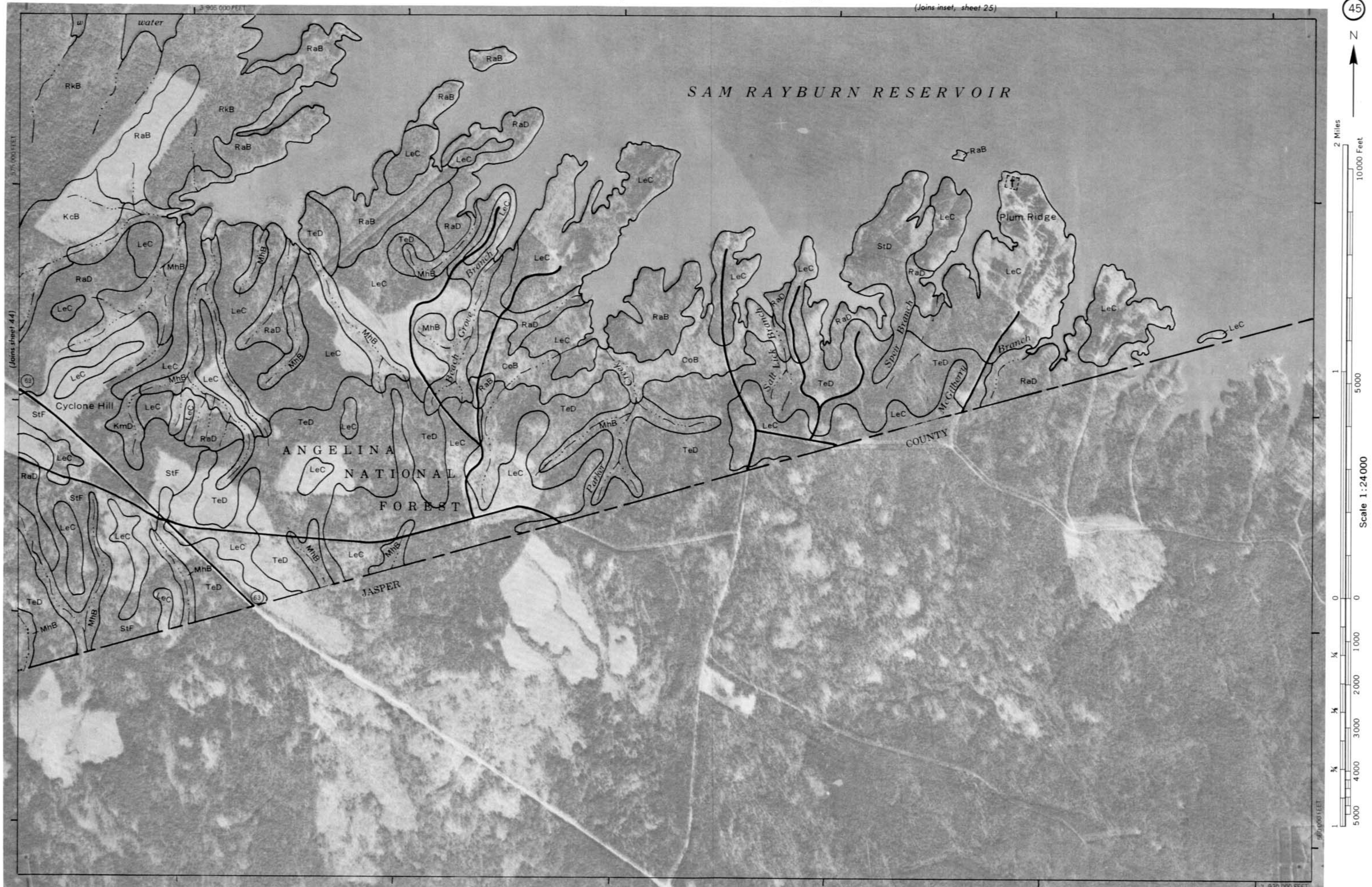
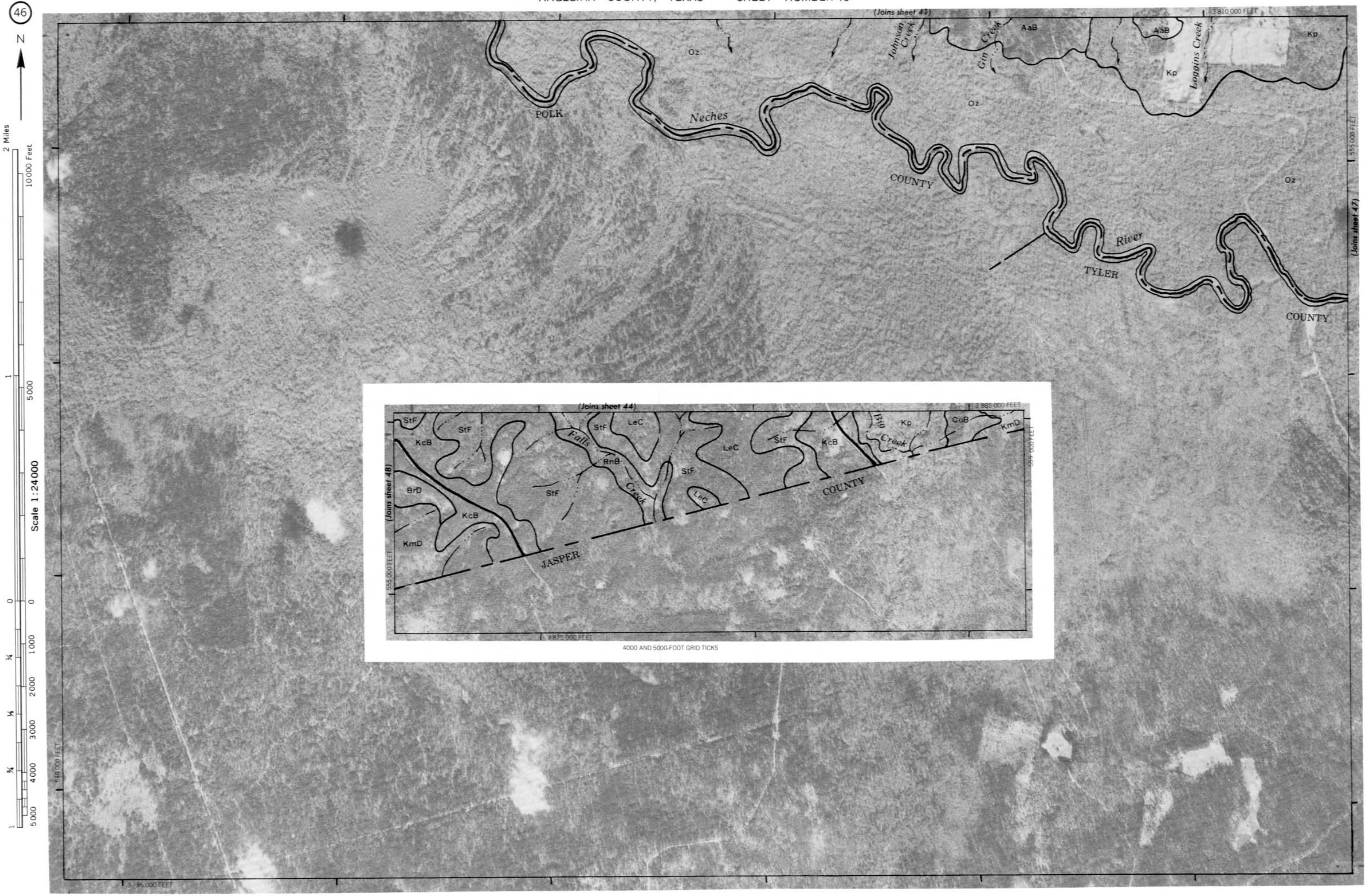
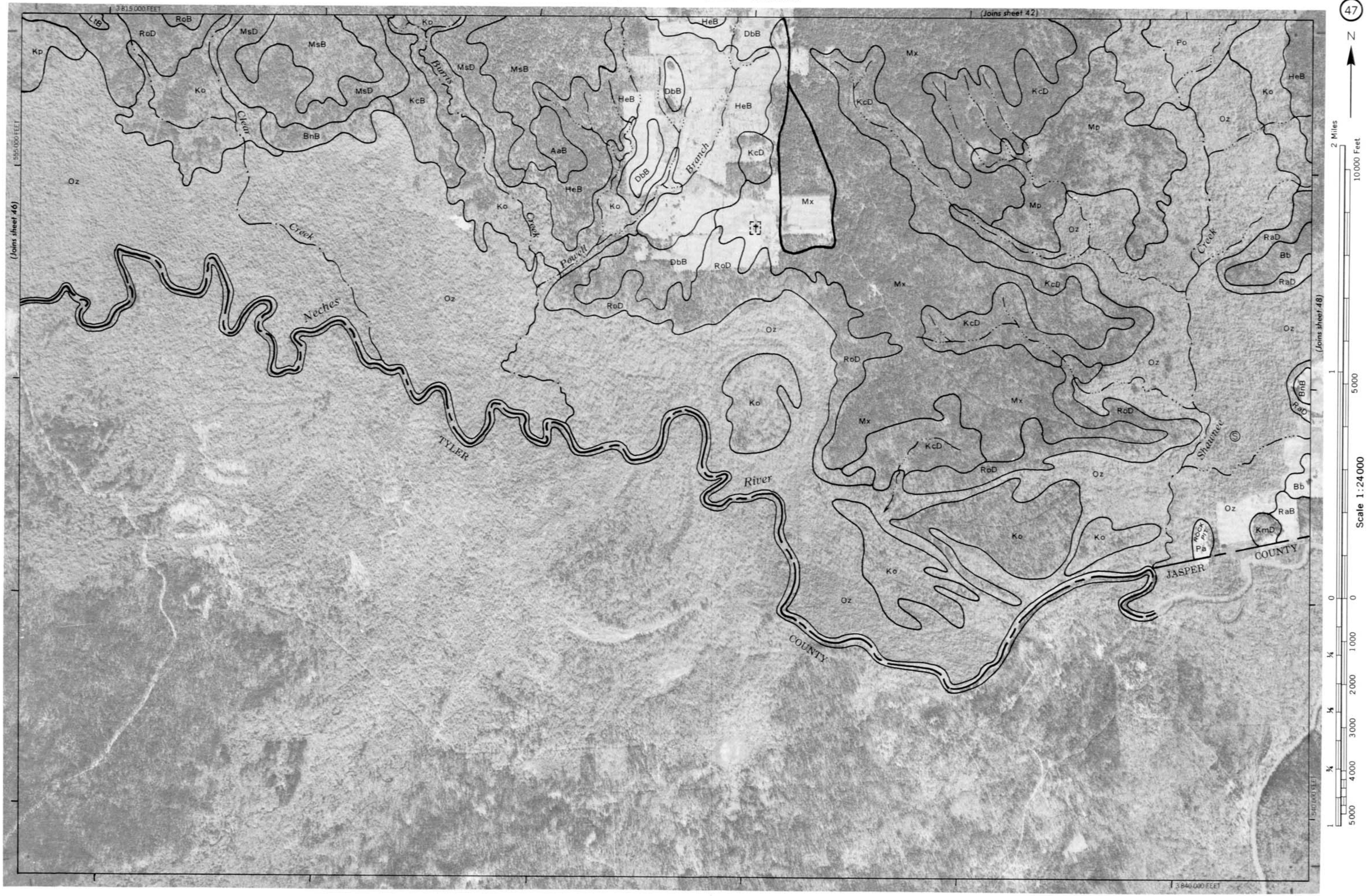


ANGELINA COUNTY, TEXAS — SHEET NUMBER 46



This map is compiled on 1975 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



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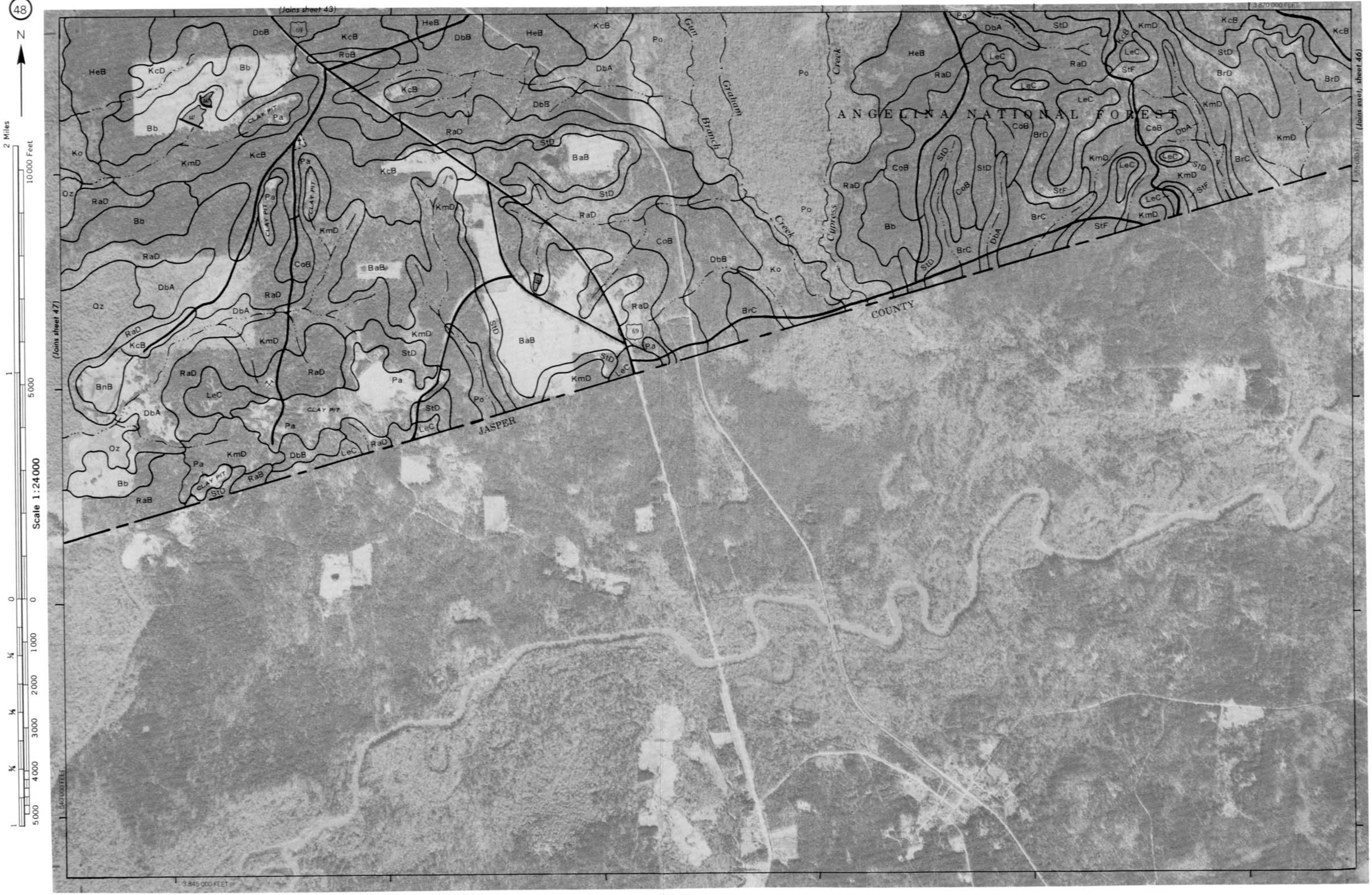

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